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People & the Planet

Volume 6 Number 3

HEALTH AND THE ENVIRONMENT

Front cover: Children playing in a polluted river, Bogotá, Colombia
Credit: German Castro/Panos Pictures
Left: Chemical outflow into a stream, UK
Credit: David Drain/Still Pictures

People & the Planet

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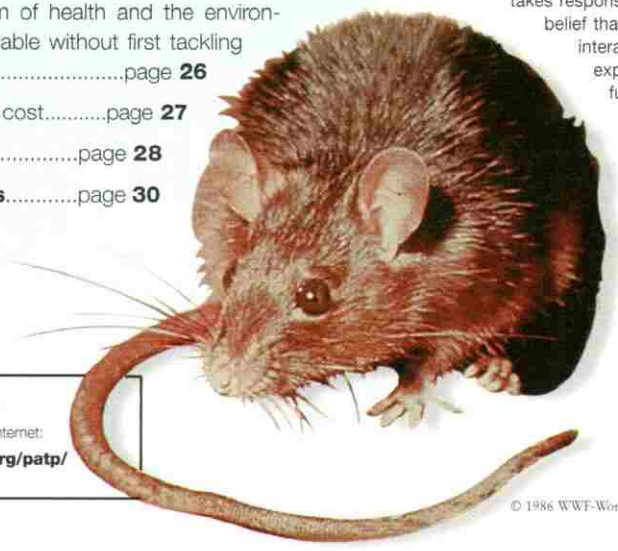

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The new agenda

Of all the thematic issues tackled by this magazine since the 1992 Earth Summit, this review of the connections between human health and the global environment has been the most daunting to assemble and the most disturbing to report upon. The daunting part is the sheer scale of the subject. Once 'environment' is defined in its social as well as physical dimension – as Tony McMichael rightly does in his introductory article – there is no escaping all those complex interactions between rapidly growing human population, with its massive potential to plunder and pollute the planet, made ever more dangerous by skewed patterns of wealth and poverty, and the finite resource base on which everything depends.

One helpful starting point in getting to grips with the topic was the World Health Organization (WHO). Members of its small but impressive team at the Office of Global and Integrated Environmental Health see clearly that their special concerns – insidious chemical pollution, the eruption of new diseases and the resurgence and spread of old ones, dirty and inadequate water supplies, unsafe and insanitary human settlements, air pollution in all its forms, and the threat to human health from ozone depletion and climate change – all fall within a broad social and ecological context. They also appreciate that resource depletion of every sort is part of the long-term prospect for human health.

Greg Goldstein, who co-ordinates the WHO Healthy Cities Programme, puts matters into an even more controversial context in his 'Last Word' for this issue. In his view, there can be no sustainable development, or escape from the threat to health from environmental degradation, until a new agenda is set to reverse growing inequity and to build a new social cohesion at global, national and local levels. The urgency of that message is borne out by the many disturbing reports from our other contributors – especially those who question the price of a world awash with man-made chemicals of which we know so little. As Tony McMichael puts it, the trends towards increasing consumption and life expectancy are on a parallel course with the physical alteration and chemical contamination of our environment. The question is how long can this go on "before the depletion of the world's ecological and biophysical capital rebounds against the health of the human population?"

John Rowley

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The following 'associates' are partners in the development and distribution of *People & the Planet:* AVSC International, Audubon, Center for Communication Programs, John Hopkins School of Public Health, Earthwatch, Centre for Development and Population Activities, Family Health International, Futures Group, International Institute for Environment and Development, International Union for the Scientific Study of Population, Pathfinder International, Population Action International, Population Concern, Population Reference Bureau, Royal Swedish Academy of Sciences, Television Trust for the Environment, WWF-Alliance for Religions and Conservation.

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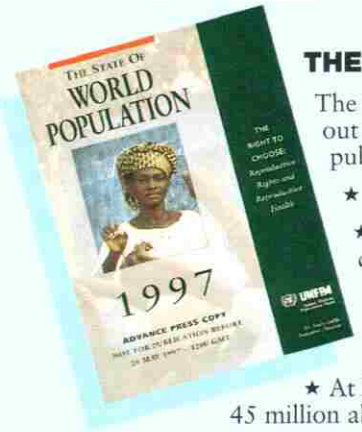


THE PRICE WOMEN PAY

The price which women pay for denial of their sexual and reproductive rights is spelt out in the latest *State of World Population* report from the UN Population Fund, published in May. These effects include:

★ 585,000 deaths from pregnancy-related causes each year.

★ 200,000 maternal deaths each year as a result of a lack or failure of contraceptive services.

★ 120-150 million women – who want to limit or space their pregnancies – without effective means to do so, and 350 million women without access to a range of contraceptive services.

★ At least 75 million unwanted pregnancies each year (out of about 175 million), resulting in 45 million abortions. Twenty million of these are unsafe, resulting in 70,000 deaths.

★ 1 million deaths each year from reproductive tract infections.

★ 2 million girls at risk each year from female genital mutilation.

★ 2 million girls introduced into the commercial sex market each year.

In addition, women are increasingly at risk from HIV/AIDS which killed 1.5 million people last year. Another 60 million girls who would otherwise be alive are 'missing' from various populations as a result of sex-selected abortions or neglect.

The report summarizes all that has been done to tackle these issues since the 1994 population conference in Cairo and concludes that while developing countries are prepared to meet the goals of ICPD, "the question remains whether richer nations are prepared to do the same."

The Right to Choose: Reproductive Rights and Reproductive Health, is available from UNFPA, 220 East 42nd St, New York, NY 10017, USA. Telephone: (+1 212) 297 5020, Fax: (+1 212) 557 6416.

BANISHING POVERTY

According to the 1997 UNDP *Human Development Report* on eradicating-poverty, a quarter of the world's people remain in severe poverty. But, it says, poverty levels have fallen faster in the last 50 years than in the previous 500, and extreme poverty could be eradicated from the globe by early next century.

The report provides an extensive overview of global poverty trends; an assessment of the scale of today's poverty problems world-wide and offers six priorities for tackling poverty at the country level plus a global agenda for supportive action.

It points out that poverty of choices and opportunities is far more crippling than poverty of income. And it puts a figure of US$ 80 billion (less than the combined net worth of the world's seven richest men) as the price of ending world poverty by the early years of the 21st century.

After undertaking a comprehensive programme of human development, Oman, it says, achieved some of the most rapid advances ever recorded. Life expectancy has risen by 30 years, from 40 in 1970 to 70 in 1994. Infant mortality was reduced from more than 200 per 1,000 live births in 1960 to less than 30 in 1994. Over nine years from 1982 to 1991, Thailand dramatically reduced severe and moderate malnutrition, by implementing a programme of accelerated action focused on nutrition.

It describes Malaysia's strategy for accelerating economic growth and reducing inequality. Hard-core poverty fell to 3 per cent in 1993 and is set to be virtually eradicated by 2000.

The report recommends promoting sexual equality to ensure equal rights and equal access to education, health care and credit for women, as well as promoting the political rights of poor people and making clean water, education, health care and social safety nets available to all.

Human Development Report 1997,Oxford University Press, Oxford and New York. £16.99

MICROCREDIT SUMMIT

The world's first Microcredit Summit held in Washington in February "launched a global movement to reach 100 million of the world's poorest families, especially the women of those families, with credit for self-employment and other financial and business services, by the year 2005," *writes Sue Wheat.*

Providing financial services – particularly small loans and savings facilities – to the very poor, has been proved by institutions such as the Grameen Bank in Bangladesh to serve as a vital stepping stone out of poverty.

The Summit provided a platform for the experience of microfinance institutions (MFIs) to be shared and for five-year Action Plans to be devised amongst 'councils' of practitioners, parliamentarians, finance institutions, donor agencies and UN agencies.

Promoting interest in microfinance amongst the commercial banking sector was a particular focus of the Summit, and with repayment rates of MFI borrowers proving better than conventional bank borrowers, it is hoped that banks will be attracted to invest in them. Results International, the Summit organizers, estimates that $8 billion needs to be raised from banks as part of the $21.6 billion needed to attain the goal of providing credit to 100 million families.

Whether microfinance does actually reach the poorest of the poor is an issue that is being hotly debated, but this should not obscure the fact that microfinance does help vast numbers, say practitioners.

Vijay Mahajan, President of BASIX, a leading development finance institution in India, praises the Microcredit Summit for bringing microfinance into the mainstream of development finance. "But it is important that MFIs truly see themselves as 'research and development laboratories', otherwise we will merely have a PR act going on and in five years time will have to say once again that the God we were worshipping has failed."

Sue Wheat is a freelance journalist and author of *The Future for Microfinance: banking the unbankable*, available from the Panos Institute, 9 White Lion Street, London N1 9PD. Telephone: + 44 (0) 171 278 1111, Fax: + 44 (0) 171 278 0345.

Chris Stowers/Panos Pictures

GREEN LIGHT FOR CHINA

China is undertaking a major national programme to improve energy efficiency of lighting used in its buildings and factories. By increasing the efficiency of lighting products, the China Green Lights programme will reduce China's investment in power plants as well as the pollutants and greenhouse gases emitted from these plants.

With a population of more than 1.2 billion people and the world's third largest economy (after the United States and Japan), China has a huge and growing market for lamps and related lighting equipment. In 1995, lighting accounted for around 13 per cent of China's total electricity use, an estimated 101 TWh. This is equivalent to the annual output of 20 large thermal power plants, each with a capacity of more than 1,000 MW.

The benefits to the Chinese economy and the local and global environment will be substantial. The Green Lights Programme Office projects that China has the potential to reduce its lighting electricity demand in the year 2000 by as much as 24 TWh – roughly the equivalent to the annual output of five large thermal power plants. Researchers at the Lawrence Berkeley National Laboratory in California estimate a savings potential of 40 per cent in China's energy use, if the efficiency of all lamps sold in China were upgraded to meet Western-level performance standards.

During its first three years, the China Green Lights programme has focused on assessing the current status of China's lighting industry, analyzing the major barriers to improving the quality of lighting products and practices, and designing policies and pilot programmes to establish a market-oriented system for high-efficiency lighting equipment. The building blocks of the programme will include education, certification and labeling, demonstration programmes and technical assistance to industry.

Source: *E-notes* Vol VII, No 1, March 1997 (newsletter of the International Institute for Energy Conservation, Washington DC, USA).

FEWER BABIES...

Japanese couples are having smaller families than ever before. The total fertility rate, measuring average family size, has fallen to 1.43. Replacement level fertility is 2.1.

According to a survey for the *Mainichi Shimbun* newspaper, 63 per cent of women said that higher education costs were the most significant obstacle to child rearing in Japan.

J Holmes/Panos Pictures

The figures reflect a decline in the birth-rate to a record low of 9.5 births per 1,000 population. This is accompanied by a rise in the average age of women having their first child to 27.5, and an all time high in the divorce rate.

Despite these figures, Japan's population is still growing slowly. It reached a total of 125 million in 1996, an increase of 259,000. Life expectancy remains the world's highest: 83 for women and 76 for men.

...OLDER PEOPLE

Meanwhile, the number of Japanese aged older than 100 surpassed the 7,000 mark last year for the first time, according to a recent report by the Japanese Health and Welfare Ministry.

The number of Japanese aged 65 or older hit an all-time high of almost 19 million or 15.1 per cent of the population last year. According to the government, the number of aged in Japan is projected to rise to 27.7 million by the year 2010.

OZONE ALARM

The ozone layer above the Arctic fell to a record low in March this year, according to new satellite data released by the US space agency NASA.

The ozone layer, which protects us from potentially harmful ultraviolet sunlight, was 40 per cent thinner than the average between 1979 and 1982. Though not a "hole", this continues a downward trend: last year, the March level was 24 per cent down on the 1979-82 levels. The ozone layer always thins in March – meaning that unprotected sunbathing in the early part of the year can be more hazardous in the long term.

Last November, an expert panel of scientists said children today will face a lifetime risk of skin cancer which is 4 to 10 per cent higher because of ozone damage. The increase in ultraviolet light is also expected to affect crops and animals, plankton in the sea, and synthetic materials, although it is not yet possible to gauge the damage.

Worldwide, the average ozone layer has a thickness of 300 "Dobson units" – about equal to two small stacked coins. In March, the Arctic level fell to 219 Dobson units. In the Antarctic, the ozone hole measures about 100 Dobson units.

Source: *The Independent*, London, 10 April, 1997

EARTH SUMMIT + 5 GETS 'D' FOR DEFAULT

"If we had to grade progress on implementing the pledges made in Rio, five years ago," remarked a spokesperson for a collection of Japanese NGOs, "we would have to give the entire process a 'D' for default."

As some 2,000 delegates and 45 heads of state or government gathered in New York in June to review and appraise the implementation of Agenda 21, the Earth Summit's Action Plan, it was clear that precious little progress has taken place since the United Nations Conference on Environment and Development folded its tents in Rio de Janiero in June 1992. Even a watered down political statement could not be issued at the end of the UN special session, despite weeks of acrimonious debate.

The funding news from Rio +5 was no more encouraging. A proposal to set up an intergovernmental committee on financing Agenda 21 was put off until further notice. Japan, the largest single donor of foreign assistance, in terms of amount, announced that it was cutting back on ODA, reflecting the general trend since 1992.

Earth Summit +5 was also unable to reach any agreement on new targets or timetables for reducing carbon dioxide and other greenhouse gas emissions to the atmosphere. The European Union's proposal for a reduction in carbon dioxide emissions of 15 per cent by 2015, over 1990 levels, was unacceptable to the United States, backed by Japan.

The Japanese called the EU proposal "inequitable", since it allows some countries to actually increase emissions, while everyone else is struggling to reduce them.

Since no agreement was reached in New York it will be left to two interim meetings in Bonn, Germany and the final meeting at the Kyoto Climate Summit in December 1997 to produce a workable plan. But unless deepening differences can be ironed out over the summer, it appears that the Climate Change Convention is headed for hot water.

Don Hinrichsen

A full report on prospects for sustainable development after Earth Summit +5 will appear in our next issue.

The many, often insidious, challenges to human health from changes in the physical and social environment of our planet are outlined in this wide-ranging overview by **Tony McMichael**.

Healthy world, healthy people

"The environment" is an accommodating term. Minimally, it refers to the physical and chemical conditions in the living space around us, such as the quality of local urban air, freshwater supplies and the concentrations of chemical residues in food. A more liberal definition includes the conditions of the social environment – encompassing everything from housing quality to transport, recreational amenities, population growth, density and mobility, social networks, and political and distributive equity.

From such a definition of environment flows a long list of health hazards. We are well familiar with the adverse health effects of extreme disasters such as Minamata, Bhopal, Chernobyl and Love Canal. In 1981-82, adulterated cooking oil in Spain caused about 600 deaths and serious illness in 20,000 people. Meanwhile, most of the burden of environmentally-induced poor health and early death arises less obviously.

It results from persistent exposures to polluted air (both ambient and – in many poor rural populations – domestic), faecally contaminated drinking water, physical hazards, agricultural pesticides and other noxious agents. Such exposures abound particularly in poor, powerless and under-educated Third World populations. The World Health Organization (WHO), estimates that around two-thirds of diarrhoeal episodes around the world – the cause of three million deaths in young children annually – arise from contaminated food or water.

These exposures are diverse, widespread, and (often) poorly documented. Their health effects are often insidious. Environmental lead exposure, for example, blunts young children's intelligence. Yet this public health problem – increasingly evident in traffic-congested cities in developing countries – does not figure in health and vital statistics. There are recent concerns that other widespread environmental exposures may act in non-specific fashion – for example, the blunting of the immune system response that may result from our accumulating exposure to organic pesticides, or the possible effects upon fertility and reproduction from the accumulation of endocrine-disrupting chemicals in the environment. Recent research by the World Resources Institute indicates that thousands of men who were exposed to nematicide dibromochloropropane in Costa Rican banana plantations in the 1970s (well after it was banned in the United States) suffered from reduced fertility.

Many such environmental hazards remain suspected but unconfirmed. There are two reasons why cause-effect relationships may be elusive. First, environmental exposures are typically diffuse, and thus are less amenable to the counting-and-scoring methods of epidemiology than are individual-level behavioural, occupational or biomedical factors. Second, although the prevalence of exposure may be very high (indeed universal) within a community, the average level of exposure is often lower and longer-term than those higher-impact exposures associated with extreme acute events or with the occupational environment.

Meanwhile, there is a larger challenge; a seeming paradox. On many counts the environment has manifestly deteriorated both locally and globally – yet human life expectancies have increased in recent decades in most countries. However, we must understand that certain types of environmental damage may only impair health when thresholds are passed: when the inputs needed to *sustain* good health become deficient. There is, for this reason, no necessary immediacy between environmental change and human health.

The community health impacts of forest clearance, land degradation, depletion of aquifers, climate change or loss of biodiversity occur predominantly via pathways that are neither simple nor direct. These pathways thus differ from those of local directly-acting chemical toxins, physical agents (such as radiation) and locally-circulating microbes. For many such "traditional" environmental exposures – whether pesticides in drinking water or particulates in air – we assume that approximately linear threshold-free relationships apply: a little exposure will do some harm; a lot will do more harm.

To take full account of how environments affect our health, we must extend our "environmental health" lexicon to include the fundamental long-term role of ecological systems and processes as life-support systems. We are no longer talking only of an increased exposure to specific extraneous hazards as a cause of *bad* health. We are also recognising the depletion or disruption of natural biophysical processes that are the basic source of sustained *good* health. This includes the ecosystems

Above: Smoke from the chimneys of the London Brick Company works, UK. Main Picture: Children playing in the Pasig River, Manila,Philippines, where factories regularly dump waste.

Neil Cooper/Panos Pictures

that determine, for example, the productivity of food-producing systems on land and sea and the range of infectious (especially vector-borne) disease agents. It includes global systems such as the hydrological cycle and the stratospheric 'ozone shield' against excessive solar ultraviolet irradiation.

The considerable recent gains in health and longevity, first in westernized countries and subsequently in others, have depended primarily on reductions in early-life infectious disease mortality. Basic gains in food security, hygiene and water sanitation, supplemented by advances in vaccination, antibiotic treatment and oral rehydration therapy, have changed the profile of infectious disease mortality in most populations. These technical and social improvements have been closely bound up with the processes of urbanization, industrialization and increasing material wealth. They, and the resultant gains in life expectancy, have therefore proceeded in parallel with increasing levels of physical alteration and chemical contamination of our ambient environment.

We must now ask ourselves: for how long can we expect to maintain these parallel increasing trends in consumption, life expectancy and environmental impact? At what stage might depletion of the world's ecological and biophysical capital rebound against the health of human populations?

As a species, we humans are uniquely inventive, resourceful and adaptive. The heterogeneity and flexibility of our personal behaviours, local diets and community cultures provides a buffering against many potential adverse environmental exposures. Yet it is becoming increasingly difficult to remain optimistic about our mode of 'dominant species' stewardship of this planet and our capacity to sustain healthy and happy populations in the coming century.

The dominant economic mode, today, is shaped by rapid technological change, acquisitive consumerism, a discounting (or ignorance) of distant and deferred environmental impacts, and a pervasive free-market ethos. Currently, the policy-setting role of national governments is contracting, as trade and financial transactions become globalized, as the balance of power between private and public sectors shifts, and as the resultant cost-cutting competitiveness puts a squeeze on social expenditures. So, just when co-ordinated, strong and farsighted government is needed to reduce damage to the world's ecological infrastructure, and hence to the sustainability of human health, we are instead entrusting ourselves to the limited-vision rationalism of the market.

Some of the environmental consequences are evident enough. As the rich-poor gap in the world persists, indeed widens, so the perennial public health scourges of malnutrition, unclean drinking water, unsafe housing, vector-borne infections and hazardous occupations continue. As the international car industry targets the huge aspiring middle-class markets in India, Southeast Asia, Latin America, China, Eastern Europe and elsewhere, so cities are transformed, air is polluted, and urban life becomes more fragmented and more hazardous. (With Japanese money, the city of Calcutta is about to displace tens of thousands of its slum and street-side dwellers and their pedal-rickshaw breadwinners with a complex of vast concrete fly-overs. A timely investment by a nation that sells cars to the world.) Chemical wastes are increasingly contaminating and affecting fish, bird, reptile and amphibian species.

Meanwhile, many vital, life-supporting, components of this closed-system planet are showing signs of systemic stress: arable land, ocean fisheries, freshwater supplies, climatic processes, and biological and genetic diversity everywhere.

John Newington/Still Pictures

Some scientists think that we may be seeing early evidence of ecological and health-related impacts of climate change. For example, the recent concurrence of retreating glaciers, upward migration of alpine plant species, and reports of an increased altitudinal range of malaria and dengue in highlands in several continents may be an early signal of the consequences of global warming. WHO has reported that the recent epidemic of meningitis in sub-Saharan Africa has coincided with the extension of dry zones – an extension that may have resulted from land-use patterns and regional climatic change. Many other components of the apparent worldwide emergence and resurgence of infectious diseases may be due to these multiple, large-scale, ecological, demographic and social disturbances.

We thus approach century's end with a mixed and widening agenda of environmental health challenges. Of course, we must continue to seek clean, safe and socially intact living environments. We must respect the vulnerability of local and regional ecosystems – and understand that there are better ways of managing local biological problems (whether plant pests, rodent populations or mosquitoes) than with hazardous and ecotoxic chemicals. We need the imagination to perceive a larger spatial and temporal dimension to the "environment" than we had previously appreciated. Partial recognition of this dimension was an important difference between the policy frameworks of the Stockholm (1972) and Rio (1992) UN conferences on the environment.

This enlarged agenda seems daunting. But we are beginning to understand the profoundly ecological nature of the larger environment-and-health relationship. In turn, this is helping us to perceive connections between local, regional and global impacts, and to understand that actions taken to prevent future adverse global-change impacts need not detract from tackling today's environmental health problems. These are all parts of a greater whole.

The sheer scale of today's environmental problems will require us to take stock of our priorities and to seek socially and ecologically sustainable ways of living. Time is relatively short, the issues are complex, communities are naturally (and in some ways reassuringly) conservative, and politicians in democratic systems have limited spatial and temporal horizons. Even so, there is evidence that people instinctively understand many of these issues and, when thus confronted, will declare a primary preference for security, happiness and health. Hence, there is an increasing public resistance to road-building in Britain; to dam-building in India; to logging in various Latin American countries; and to golf course construction in East Asia.

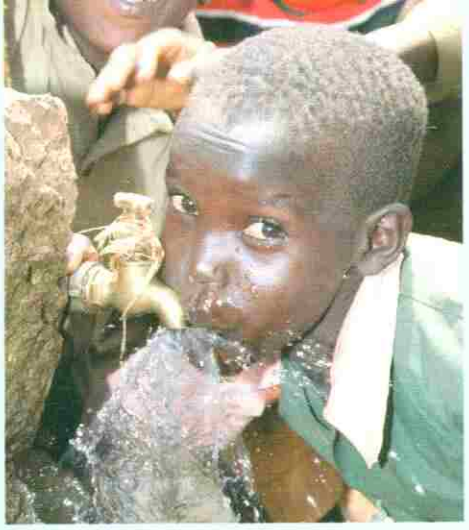
We must look beyond the restricted view of 'environmental health' as a problem of local pollution – a problem amenable to piecemeal and technical management (but often compromised when 'economic growth' is the competing value). Rather, as we acquire a more integrated view of the world's environment, its ecosystems, and their fundamental role in sustaining the health of a growing population, so we must think more radically about how best to manage and sustain these essential life-support systems – while also maintaining the immediate quality and safety of the local environment. ■

Hartmut Schwarzbach/Still Pictures

Tony McMichael is Professor of Epidemiology at the London School of Hygiene and Tropical Medicine and author of *Planetary Overload. Global Environmental Change and the Health of the Human Species*, Canto/Cambridge University Press, 1995, £7.95pb. He chaired the scientific panel that wrote the chapter on potential health impacts for the UN's Intergovernmental Panel on Climate Change during 1994-96.

Top left: Dead cattle in polluted water, Zimbabwe
Left: Forest burnt for farming, Madagascar
Above: Traffic congestion, Bangkok, Thailand
Main picture: Global warming threatens to increase flooding in Bangladesh

Gil Moti/Still Pictures



Sean Sprague/Panos Pictures

For nearly 100 years, public health workers have generally believed that the most important advantage of a good water supply is that it is safe from contamination. Mothers of small children in poor communities around the world have long known better. To them the most important advantage is that it is convenient and provides enough for their needs. **Sandy Cairncross** reports.

More water: bet

Only in the last decade or so have public health workers and engineers come to understand that improved convenience and quantity of water available can bring greater benefits to the users than improvements in quality.

This is true, even though many different infectious diseases are related to water in a variety of ways. These can be grouped into four categories.

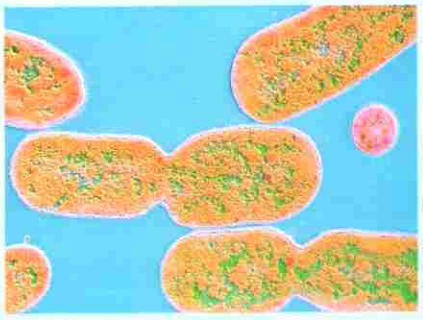
The most common and important are *Faecal-oral* which are caused by micro-organisms (such as bacteria or viruses). These are present, usually in vast numbers, in the faeces of infected people. One only needs to swallow a few to have a chance of falling ill, so that if microscopic amounts of faecal material from one person reach the mouth of another, the disease can be passed on. Most of them cause diarrhoea. They kill over three million children a year, mostly under five years old.

Some of these diseases, such as cholera and typhoid fever, are famously described as "water-borne diseases". However this is a misnomer, as drinking water is only one way in which they can be transmitted. All of the faecal-oral infections can also be passed on by contaminated food, fingers, utensils and even clothes.

Above: Drinking from school faucet, Kenya

Right: Woman collecting water from Bishumati River, Kathmandu, Nepal

Below: Rod shaped bacillary dysentery bacteria



CNRI/Science Photo Library

One study in Dhaka, Bangladesh found that poor women sometimes used the corner of their sari to wipe the dishes, clean their child's face, and even to clean his bottom! Disease transmission in ways such as this can be prevented by having more water available in the home to keep things clean.

Water-washed skin and eye diseases have little to do with water quality. They are most common in arid areas where water for household use requires hours of drudgery to carry it home, or a heavy payment to a water vendor. For them too, more water, readily available, is the best preventive measure. Some of these diseases can have very serious effects; for example, trachoma can cause permanent blindness – a terrible fate to suffer in the Third World.

Water-based diseases are caused by certain parasitic worms which cannot pass directly from person to person, but must first develop in another animal which lives in water, usually a snail. The most famous of these is schistosomiasis (bilharzia), which is caught by wading or swimming in infected water. Even a tap in the backyard is unlikely to prevent this, unless it prevents children from swimming in the local pond on a hot day.

Water-related insect vector diseases are spread by insects which breed in water (such as mosquitoes) or bite near to rivers. The different types of insect responsible for each disease in each part of the world prefer different bodies of water in which to breed. One type, for example, breeds in the water storage tanks on large buildings in Indian cities, and transmits malaria; another likes septic tanks and puddles of waste washing water, and transmits a disfiguring condition known as elephantiasis, in Asia, East Africa and coastal Brazil. Water supplies do not often help to control these; rather, they can make things worse.

The greatest public health benefit from improved water supplies is the reduction in faecal-oral diseases. It has been estimated that of the deaths and

Hartmut Schwarzbach/Still Pictures

hospital admissions in East Africa which can be prevented by water supplies, 90 per cent and 50 per cent respectively are in the faecal-oral category.

Engineers in the Third World therefore need to ask whether the faecal-oral infections are mainly water-borne (due to poor water quality), or mainly transmitted by food, fingers and other such "water-washed" routes (related to water quantity). Should they spend the scarce funds available for water supply on better water treatment to improve quality, or on more and bigger pipes and water sources, to increase quantity?

This has not been an easy question to answer. It is not possible to catch a micro-organism *in flagrante delicto* at the moment when it infects somebody; by the time someone gets ill, the contaminated water has usually been drunk, the food eaten, the hands washed. Nevertheless, research in recent decades has underlined the importance of general domestic hygiene.

For example, a few years ago a Bangladeshi epidemiologist persuaded the families of some dysentery patients to wash their hands with soap before handling food, and after defecation; this simple measure, he found, prevented 85 per cent of cases of dysentery in these families. By contrast, a Brazilian team persuaded poor households to disinfect the water in their storage pots with chlorine. Tests showed that the water was being disinfected correctly, but these families had no less diarrhoea

ter health

than others who drank heavily contaminated water.

Of course, this does not mean that water quality is unimportant; everyone knows that contaminated water can cause serious epidemics, because large numbers of people drink from the same supply. Rather, the endemic disease which is the day-to-day reality of poor families around the Third World, and particularly affects their small children, is unlikely to be reduced by better water quality.

How can people living in poverty, who may hardly be able to afford soap, be encouraged to be more hygienic? One way is to make water more easily available to them. One would at first think that providing water closer to home would lead people to use more of it; but surprisingly, this is only true in certain cases.

If the water is originally more than 1 km away, then bringing it closer will increase the amount used. However, at about that distance (or when a round trip time to collect water takes about 30 minutes) a plateau is reached and the level of use stays constant. Only when water is within a few yards of the house, on the plot or even piped indoors, does consumption increase. Then it doubles or trebles.

Why should this be? Perhaps we need to explain the changes in consumption, rather than the plateau. A mother on the plateau keeps a container of water in her kitchen; when it is empty, she goes and fills it. There is a qualitative difference from one beyond the plateau; since water collection takes more than half an hour, she plans it for a particular point in her day, and if the water starts to run out before then, she economises. On the other hand, when one has water available in the house or yard, there is another qualitative change; one uses the water directly at the tap or pump.

Policy implications

The first lesson for policy-makers is that the households and communities which will benefit most from improved water supply are those farthest from their existing sources of water. Not only will their health show the greatest improvements (through the reduction of faecal-oral and water-washed skin and eye diseases); they will also benefit most from the saving in women's time and drudgery spent collecting water and carrying it home. Many poor households pay substantial amounts for water delivered to their door, which shows that their time has a money value.

Second, if all are already on the plateau, the provision of water at public taps or pumps, however pure, is unlikely to produce any substantial health benefit, though they will of course be glad of the convenience. (An exception to this rule is where Guinea worm is common, as this water-based disease is *only* caught from drinking water. Guinea worm disease is rarely found outside the Sahel belt of Africa, and a campaign to eradicate it is making rapid progress.)

Third, in-house connections are well worth considering if they are affordable and enough water is available to meet the increased demand they will generate. Not only can they be justified on health grounds. A sceptical World Bank economist found some years ago that the value of time spent carrying water was enough to justify house connections in most typical circumstances, *regardless of any health benefit.*

A further advantage is that people appreciate them so much that they are more willing to pay for them; and it is easier to collect the revenue, because non-payers can be disconnected. Studies in Latin America, also by a World Bank team, have shown that provision of free water at public standpipes has negligible effect on the demand for house connections. ■

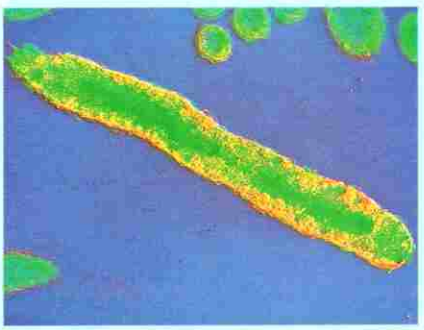
Sandy Cairncross, an engineer and epidemiologist, is Reader in Environmental Health at the London School of Hygiene & Tropical Medicine.

CNRI/Science Photo Library

Neil Cooper/Panos Pictures

Right: Tonga child carrying water from a well, Chunga, Zimbabwe

Below: Cholera bacterium: transmitted through contaminated water, food, fingers, utensils and even clothes



CNRI/Science Photo Library

Arsenic on tap

Arsenic poisoning is contaminating underground water supplies across northern Bangladesh and threatening the lives of millions. **Inam Ahmed** and **Aasha Amin** report.

Benagari Chuadanga

There is a cloud of gloom overpowering the otherwise sleepy town of Samta in Jessore, a northern district of Bangladesh. Almost every home you visit there has a child or adult suffering from a mysterious disease. Many have died and the villagers have lost count of the casualties, most of them small children.

The symptoms are frightening: watery eyes, chronic indigestion, colds and stomach cramps in the early stages and swollen limbs with bleeding gangrene-like wounds in severe cases. This silent killer is arsenic which has contaminated the drinking water of many villages in northern Bangladesh.

Runu, 12, of Samta village, has a strange pigmentation on her skin due to keratosis, a constant runny nose and difficulty in breathing – all tell-tale signs of arsenic poisoning. Within the last five years, it is not only her health that she has lost. Both her parents and two brothers have died from the disease.

"I used to go to school when my parents were alive," says Runu looking quite lost, "my mother used to dress me, braid my hair and send me to school everyday. I never slept without holding her hand."

Now, Runu struggles to survive working as a maid for a family which has also been affected by arsenic poisoning: other families refused to employ her. Her parental home is in ruins. Nobody lives there anymore.

In fact, children are the worst victims of arsenic poisoning says Dr Mahmudur Rahman of Community Hospital in Dhaka, the only organization so far, to carry out an investigative survey of the problem. "Children under 15 constitute 45 per cent of the population," comments Dr Rahman, "which means that out of the 50 million feared affected almost 20 million are children."

According to Dr Rahman, those children who are affected, have been consuming arsenic, through water, from a very early age. "Moreover," he says "in the countryside most children are poor and undernourished, which makes them more vulnerable to poisoning. Those who have reached the keratosis stage of poisoning cannot be saved," adds Dr Rahman, "fortunately most of the children have not yet reached this stage and there is still time to cure them through proper treatment."

But while early diagnosis and treatment may help the affected children, immediate measures must be taken to stop further contamination. According to the World Health Organization, (WHO), the maximum allowable arsenic content in water is .01mg in every 1000cc of water. In the arsenic hit areas this is as high as 2.7mg for every 1000cc of water. So far, the government has done little to address the problem.

Dr Dipankar Chakravarti, Director of the School of Environmental Studies, Jadavpur University, has done an intensive study of arsenic poisoning both in West Bengal and Bangladesh. He says more than 50 million people across Bangladesh are at risk while thousands already show symptoms of poisoning. In severe cases, victims develop lesions that cause parts of the body to degenerate and break off. Others have cancer or serious liver damage.

Socially, too, the victims suffer. Treated like lepers villagers shun them and prevent them from taking water from uncontaminated tube wells. Says Badsha, 16, who has already developed keratosis, "My friends don't play with me anymore because they are scared that they may catch the disease."

In 1993, Dr Chakravarti reported his findings to the Bangladesh government and WHO but his warnings went unheeded. It was only much later when other experts as well as the media brought the horrifying stories to the surface that the government began to take notice.

Some hand tube wells were sealed off but villagers began to re-use them as alternative water sources were too few. Of the 34 districts from where water samples were collected, 22 had high levels of arsenic.

Experts have suggested a three-pronged action plan to address the problem. First of all, arsenic contaminated tube wells must be sealed off, public awareness has to be raised and people have to be persuaded to use alum water to neutralize the effect of arsenic. Secondly, ponds have to be identified and reserved exclusively for drinking water and the wasting of underground water from deep tube wells (one of the causes of rapid spread of contamination), has to be stopped.

Finally, the government will have to initiate watershed management to ensure safe ground water supplies to villages. Comprehensive studies have to be done to find out factors such as why one family is affected while another seems to have developed immunity to the effects of the contamination.

While the government deliberates on checking the contamination, time is running out for the people of the northern districts. Unless something is done right now there will be many more human tragedies.

Inam Ahmed and Aasha Amin are feature writers on the staff of the *Daily Star*, Bangladesh.

Why arsenic?

Scientists have not been able to decide on the exact cause of arsenic contamination in Bangladesh. There is, however, one plausible theory. According to Dr Atiq Rahman, Director of the Bangladesh Centre for Advanced Studies, some of the geological layers of the soil have minerals containing arsenic. Thus, over-irrigation of the deep tube wells may result in soil erosion that exposes the layer to oxygen. When oxygen gets mixed with the arsenic it will enter the water and so contaminate it.

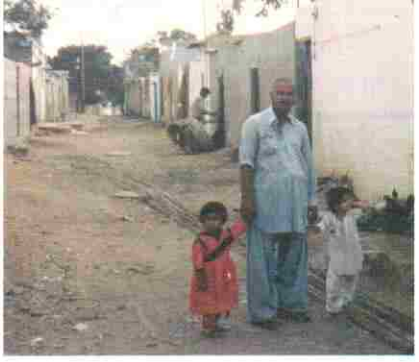
But there are irregularities regarding this theory. It has been found, for example, that while one tubewell's water has high levels of arsenic, another only 100 yards away is not contaminated. "We do not know enough about the cause," says Dr Rahman, "the only thing that is certain is that it is geological in nature."

The simplest method suggested of reducing the arsenic level in drinking water is the age-old use of filtering the water. This method, however, has not proven to be very popular among people because of the time it takes. Meanwhile the World Bank has taken a special interest in the problem and has decided to initiate a major effort to check arsenic contamination.

Left: Black spots on the hand indicate the final, fatal stage of the disease

Self-help sewers save lives

The Orangi Pilot Project in Karachi is one of the world's best known community efforts to provide sanitation and waste-water management. **Anita Nasar** revisited Orangi for *People & the Planet* to see how this revolutionary project is progressing.



OPP

In 1980 Mr Agha Hasan Abedi, the President of the now infamous BCCI and Mr I. H.Burney of the BCCI Foundation approached Dr Akhter Hameed Khan with a suggestion to consider undertaking some "welfare work" in Orangi, Karachi's biggest informal housing settlement. In response to this request, Dr Akhter Hameed Khan a guru for many of Pakistan's development professionals, set up the Orangi Pilot Project (OPP). Since then Dr Sahib, Orangi and the OPP, now one of the world's best known projects in the provision of sanitation and waste-water management, have never looked back.

Once mired in filth, wracked with disease, high infant mortality rates and burdened with the countless other miseries, typical of urban slums, today Orangi is an economically vibrant and thriving settlement of over one million residents, with health and education indicators far higher than the rest of Karachi's.

Why has OPP been so successful? A large part of OPP's success lies in its uncompromising commitment to work only with the agenda of the people whose lives it has set out to improve. "We watch to see what people are doing, identify the problems they have in their own efforts and then work to resolve these problems," explains Perween Rahman, the Director of OPP's Low Cost Sanitation Programme. This is, however, far easier said than done.

In the early 1980s after much painstaking research, OPP was finally able to identify poor health as Orangi's key problem. Most of the residents – recent immigrants to Karachi – had been able to construct their own houses in the settlement but the technicalities and the cost of installing sanitary latrines and underground sewer lines were understandably beyond them.

As was the case in many other urban informal settlements, Orangi's residents had attempted to solve this problem as best they could. Apart from incessant lobbying to have local government address the issue, soakpits had been established and makeshift channels for sewage dug up in the lanes outside their houses. Without technical guidance there was little else that could be done and in the absence of strong social institutions, there were limits to what the collective efforts of people could accomplish. (Interestingly, OPP's own research has shown that it is often the lack of technical expertise needed to address the problem at hand that frustrates efforts at social organization.)

The lack of a sanitation system and proper latrines coupled with the continuous influx of immigrants to the area proved devastating to health in the settlement. Illnesses were a norm and many of Orangi's low income residents struggled almost constantly under the burdens of insurmountable medical bills.

It was evident that the government was unable to deliver the required sanitation system and so the OPP proposed the installation of a self-financed and self-managed sewage system, offering their technical support and guidance. Cutting out middlemen and contractors and simplifying the system design, OPP's team of architects and engineers were able to put together a low-cost alternative to a government-installed and maintained sewage system.

If people were willing to finance the scheme, each lane could build their own sewer line and connect their houses to it at a fraction of the cost. This line would then connect up with the trunk sewers that the government had installed. OPP was proposing that the established ethos of self-help be collectively organized around a technical solution rather than remain *ad hoc*. It didn't take long for the people of Orangi to appreciate the wisdom of this. The red tape involved in connecting up to the trunk sewage lines was finally cut through and the first resident-financed sewers were laid in 1982.

OPP began a number of other programmes many of which reinforced the sanitation programme, particularly in the field of health and family planning. In addition, they began programmes to support work in Orangi on education, housing, social forestry, family enterprises and most recently rural development. But it is its sanitation programme where it has achieved the greatest international recognition.

Today 84 per cent of Orangi is covered by resident-financed and managed sewer lines "it should be 100 per cent, but Orangi is still growing," explains Perween. Collectively, the residents of this low-income area have, been able to raise more than US$1.7million to finance the building of what now amounts to over almost 1.5 million rft (running feet) of sewer pipelines, almost 400 section drains and over 85,000 latrines.

Coupled with the emphasis put by OPP on preventive health-care, the impact on the health of Orangi's residents has been phenomenal. In a recent survey comparing Orangi to Thikri, another Karachi settlement with a similar socio-economic profile but next to no sanitation system, it was found that infant mortality was five times higher in Thikri than in Orangi, with most infants dying of diarrhoea and dehydration. The awareness of health related issues that developed alongside the installation of the settlement's sanitation system has led to over 85 per cent of Orangi's housewives being fully conversant with the causes and prevention's of some of the more common illnesses, such as malaria, typhoid, scabies and diarrhoea. In comparison, fewer than 20 per cent of Thikri's housewives were aware of these.

These achievements are even more impressive when viewed against the backdrop of a roughly 75 per cent increase in the population of the area since 1980. With the pressure of medical bills easing off in Orangi, income has been freed up to pay for school fees – private schools are abundant in Orangi where the literacy rate is now well over 70 per cent compared to Pakistan's overall literacy rate of around 35 per cent – and to finance the small enterprises that have contributed greatly to the economic prosperity of the area.

Since 1989, OPP stepped in, on request, with technical support in setting up sanitation programmes in over 45 informal urban settlements in the country. Today it is working with people in over 35 informal settlements in six cities in Pakistan where it is assisting in laying almost 190,000 rft of sewer pipes and installing over 10,000 latrines all at a cost of just over US$300,000 – about how much a moderately successful Wall Street banker might expect to earn every year. More recently the Karachi Water and Sewerage Board have requested OPP to act as its consultant for the plan to upgrade and improve the sanitation system for Karachi city.

The development of a cadre of skilled personnel in Orangi around the area's sanitation programme has been a vital factor in the outreach and extension of the pilot project in Orangi. Approximately 75 per cent of OPP's total staff and 70 per cent of its sanitation programme staff are residents of Orangi. Once shunned by the development and municipal agencies of Karachi, ironically, it is now Orangi that is in the forefront of assisting these same agencies in coping with the mammoth task of managing a megacity's municipal services.

Anita D. Nasar is Editor of *The Way Ahead, Pakistan's Environment and Development Quarterly* published by the Communications Unit, IUCN Pakistan.

The threatene

Environmental and social changes are leading to the outbreak of new diseases and a resurgence of the old ones warns **Dr Paul Epstein**, a leading expert in health and the global environment.

According to The World Health Report 1996, 30 new diseases have emerged in the past two decades. The resurgence of old diseases is equally concerning: drug-resistant tuberculosis, exacerbated by HIV/AIDS, causes three million deaths annually, while diphtheria, whooping cough and measles – also transmitted person-to-person – are increasing, particularly where social systems have deteriorated.

Malaria, dengue ('breakbone') fever, yellow fever, cholera and rodent-borne viruses are also appearing with increased frequency. These diseases, transmitted by animals or water, reflect environmental and social change.

Global change, ranging from global warming to ozone depletion, deforestation and coastal pollution, are together altering biological diversity. And environments experiencing multiple stresses are showing increased susceptibility to the invasion and emergence of opportunistic species.

Weeds, rodents, insects and microorganisms are opportunists: they reproduce rapidly, have huge broods, small body sizes, wide-ranging appetites and are good at dispersal and colonization of new environments. In stable environments large predators fare well and keep opportunistic species under control. But in degraded environments, opportunists can seize the upper hand; just as opportunistic infections take advantage in patients with weakened immune systems.

Owls, coyotes and snakes, for example eat rodents; and rodents can devour grains and carry Lyme disease ticks, hantaviruses, arenaviruses (South American hemorrhagic fevers), human plague and leptospirosis bacteria. Control of mosquito populations is naturally performed by reptiles, birds, spiders, ladybugs and bats – and fish that consume their larvae in ponds. Mosquitoes provide nourishment for these animals – but some carry malaria, yellow fever, dengue fever and several types of encephalitis.

Several aspects of global change tend to reduce predators disproportionately, releasing prey from their biological controls. Among the most widespread of these are: habitat loss and fragmentation; monocultures in agriculture and aquaculture; excessive

Trygve Bolstad/Panos Pictures

d plague

use of toxic chemicals; excess ultraviolet radiation; and climate change and weather instability.

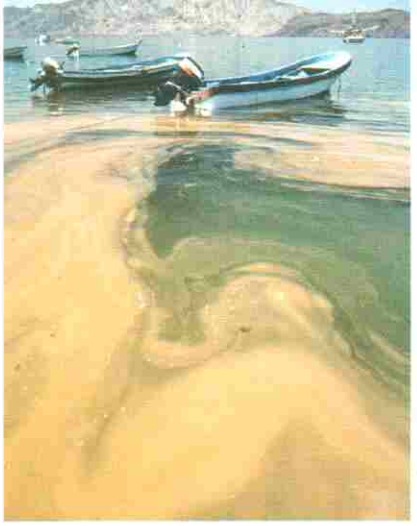
Fragmentation of wilderness into smaller patches, compounded by "edge effects," reduces the habitat for large predators, favouring pests. Monocultures, with reduced genetic and species diversity, show increased vulnerability to infections and invasions of exotic species. Excessive use of pesticides harms birds and "helpful" insects. Rachel Carson writing in 1962 in *Silent Spring* referred to the absence of the chorus of birds in spring, and the resulting resurgence of herbivores that had evolved resistance to the pesticides.

Population explosions of nuisance organisms may thus be viewed as signs of failing ecosystem health – of systems removed from equilibrium, where the ratio of animal groups performing essential functions is altered. Such multiply-stressed systems exhibit reduced resilience and resistance in the face of new stresses.

Distress syndrome

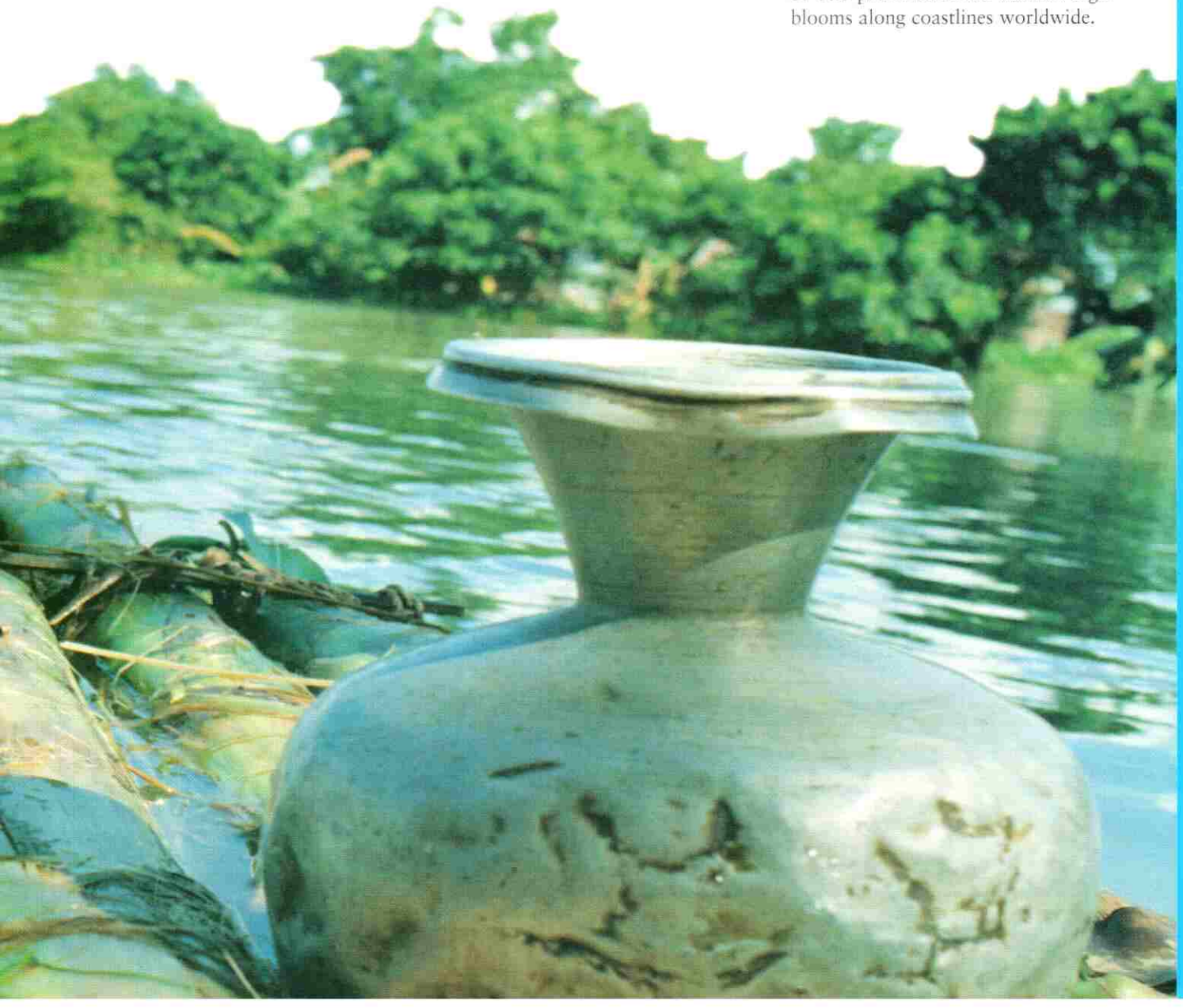
Some ecologists have begun to describe what might be considered as generalized Environmental Distress Syndrome. The symptoms of this syndrome would include:

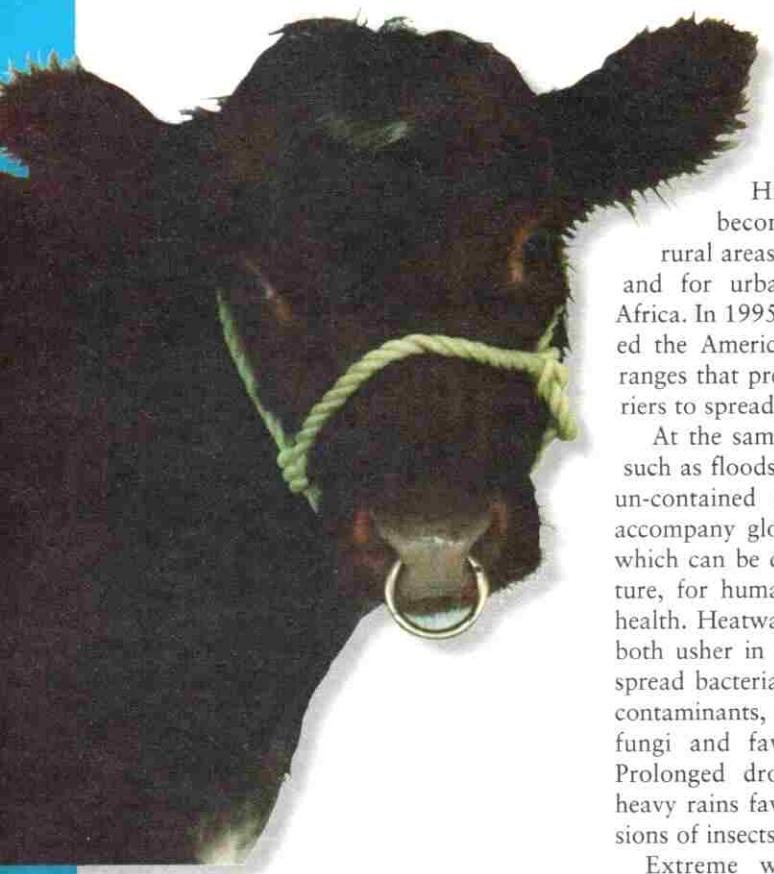
1. Emerging infectious diseases.
2. Loss of biodiversity.
3. The growing dominance of "generalists" (such as crows, Canadian geese and gulls – that have wide-ranging diets) over "specialists" (like plovers – with disappearing, localized niches).
4. The decline in one type of specialists – the pollinators (bees, birds, bats, butterflies and beetles) – whose niches and activities fit with, and are indispensable for, the preservation of flowering plants.
5. The proliferation of harmful algal blooms along coastlines worldwide.



Kevin Schafer/Still Pictures

Above: The red tide of Mexico, bloom of notilucca dinoflagellates
Below: Floods, Bangladesh





Emerging diseases

Outbreaks of vector-borne diseases are compounded by a range of social, biological and environmental factors. Peri-urban sprawl, poor sanitation and proliferating water containers, and social inequities in general, provide the setting for the resurgence of dengue fever in Latin America, for example.

But meteorological factors also play a role. In general terms, climate circumscribes the range at which such diseases can occur, while weather influences the timing of outbreaks. In the tropics, rain is the limiting factor; in the extra-tropics and at high altitudes, temperature and precipitation are key parameters.

The likely impact of climate change, in this respect, is discussed elsewhere (see pages 22), but already insects and insect-borne diseases, such as malaria and dengue fever, are being reported at higher altitudes in Africa, Asia and Latin America. Highland malaria is becoming a problem for rural areas in Papua New Guinea and for urban centres in Central Africa. In 1995, dengue fever blanketed the Americas, crossing mountain ranges that previously presented barriers to spread.

At the same time, extreme events such as floods, storms, droughts and un-contained fires are expected to accompany global warming – events which can be devastating for agriculture, for human settlements and for health. Heatwaves and winter storms both usher in cardiac deaths. Floods spread bacteria, viruses and chemical contaminants, foster the growth of fungi and favour insect breeding. Prolonged droughts interrupted by heavy rains favour population explosions of insects and rodents.

Extreme weather events (most often associated with El Niño/La Niña changes in Pacific surface ocean temperatures) have been accompanied by malaria outbreaks in Asia and water-borne diseases like typhoid, hepatitis A, bacillary dysentery and cholera, in Latin America and in Asia.

Jeremy Hartley/Panos Pictures

Nasty synergies

Rodents are a growing problem in the United States, Latin America, Africa, Europe, Asia and Australia. Believed to be the fastest-reproducing mammal, rodents eat everything humans do, thrive on contaminated water and food, and are even great swimmers. Rodents consume 20 per cent of the world's growing and stored grain; 13 per cent in the United States, and up to 75 per cent in some African nations. Rodents also can carry diseases.

Rodent-borne hantaviruses have resurged in several European nations, particularly in former Yugoslavia; and rodent-borne diseases like leptospirosis are increasingly reported in urban centres in America, where sanitation has declined. In late 1996, hantavirus infection emerged in western Argentina.

In Southern Africa, in 1994, rodent populations exploded in the aftermath of 1993 and 1994 rains; and plague reappeared in India in 1994, following a blistering summer, leaving animals prostate across the north and creating furnaces for fleas in houses with stored grains. The unusually heavy monsoons following the heatwave led to population crowding in Surat; and an apparent outbreak of pneumonic (person-to-person) plague. Malaria and dengue fever upsurges also followed in the wake of flooding.

Current land-use practices and the overuse of chemicals to control pests may increase the chances for such nasty synergies. A disturbance in one factor can be destabilizing; multiple perturbations can affect the resistance and the resilience of a system.

Coastal ecosystems

Coasts throughout the world are subject to increasing pressures, among which is a rate of human population growth double the global average. Among other pressures are excessive nutrients from sewage, fertilizers and aerosolized acid (nitrogen) precipitation; a reduced acreage of wetlands, which act as nature's kidneys to filter nitrogen and other wastes; overfishing, that can reduce predation; and chemical pollutants and excess UV-B penetration that may increase mutation levels.

In addition, global warming increases algal growth and photosynthesis, and can help shift algae to more toxic species.

In fact, all these factors favour the growth of coastal algae. And warming may also reduce the immune systems of sea mammals and coral and encourage the growth of opportunistic infections.

Cholera is more widespread today

than ever before, and there is evidence that it can be harboured in marine plankton. In 1991, cholera reached the Americas. During the first 18 months over 500,000 cases occurred in Latin America, with 5,000 deaths. In 1991, Peru lost $770 million in seafood exports and another $250 million in lost tourist revenues.

Ocean warming

There is evidence, too, that deep ocean warming is occurring and may be harming marine plankton. It may also be associated with a shift in marine flora and fauna occurring along the California coast since the 1930s.

Warming – in the presence of sufficient nutrients – may also be contributing to the proliferation of coastal algal blooms. Harmful algal blooms of increasing extent, duration, intensity – and involving new species – are being reported from nations throughout the globe. Indeed, "the worldwide increase in coastal algal blooms may be one of the first biological signs of global change" according to Theodore Smayda, a leading authority in this field.

Counting the cost

The impacts of disease on humans, agriculture and livestock can be costly. While the 1991 cholera epidemic cost Peru over $1 billion, airline and hotel industries lost from $2 to $5 billion from the 1994 Indian plague. Cruise boats are turning away from Asian islands racked by dengue fever, threatening that region's $12 billion tourist industry (employing over 500,000 people). The global resurgence of malaria, dengue fever and cholera – and emergence of relatively new diseases like Ebola, toxic E. coli and Mad Cow disease – can affect eating habits, trade, tourism and politics.

More generally, we are using Earth's resources, and generating wastes at rates beyond which biogeochemical systems can adequately recycle them. Practices affecting forestry, fisheries, petrochemicals and fossil fuels must all be examined in light of their impacts on biodiversity and the global resurgence of infectious diseases across a wide taxonomic range.

To take just one example, the impacts of oil extraction in Ecuadorian forests at the headwaters of the Amazon may be felt throughout the pathway of that great basin, with untold consequences for water quality and marine biodiversity. Fossil fuel combustion, in turn, is having enormous local and global impacts.

International governance is a key concept in dealing with such global threats. The Montreal Protocol for eliminating CFCs is an example; the United Nations Convention on the Laws of the Seas (UNCLOS) is another.

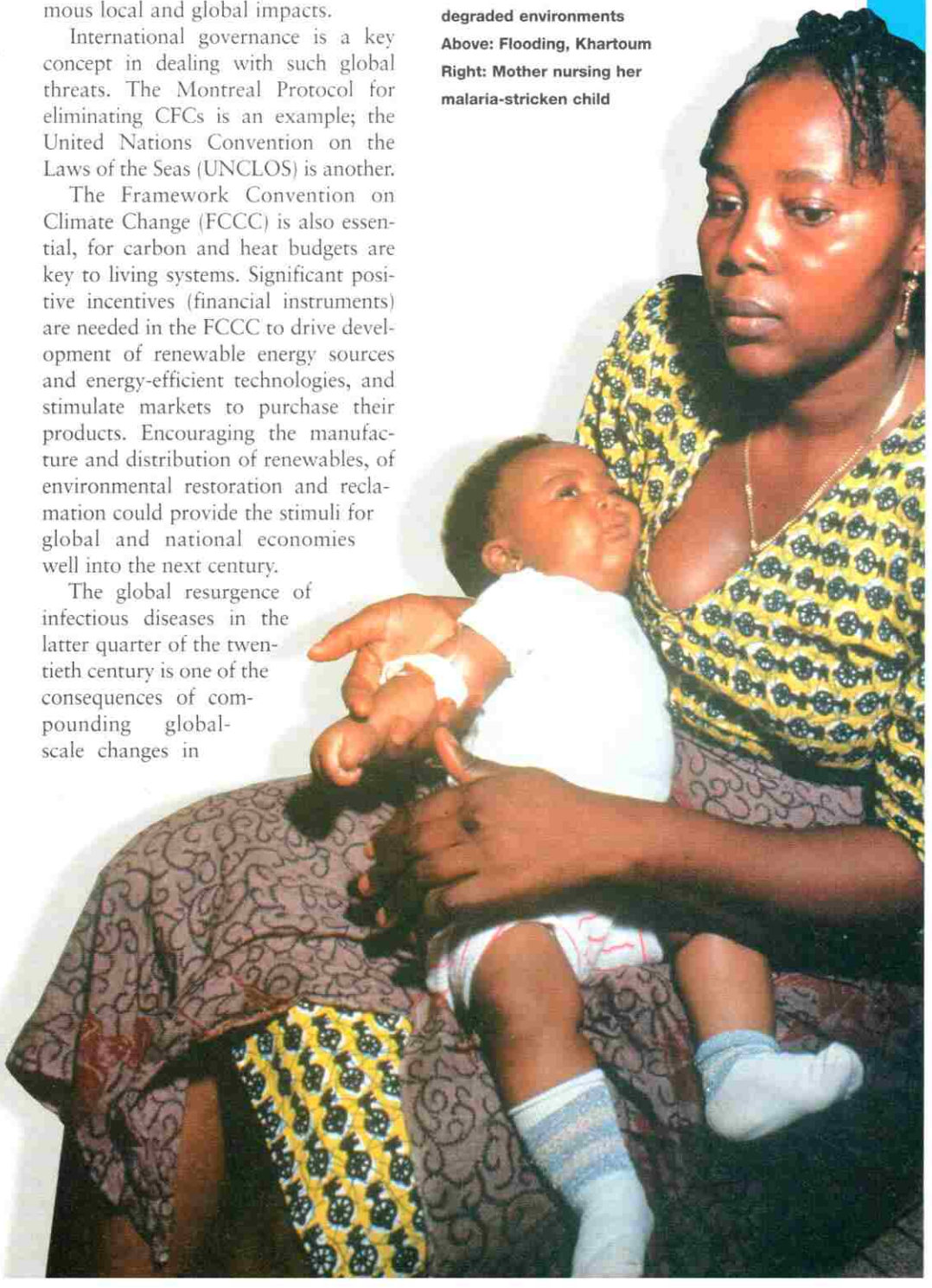
The Framework Convention on Climate Change (FCCC) is also essential, for carbon and heat budgets are key to living systems. Significant positive incentives (financial instruments) are needed in the FCCC to drive development of renewable energy sources and energy-efficient technologies, and stimulate markets to purchase their products. Encouraging the manufacture and distribution of renewables, of environmental restoration and reclamation could provide the stimuli for global and national economies well into the next century.

The global resurgence of infectious diseases in the latter quarter of the twentieth century is one of the consequences of compounding global-scale changes in physical, chemical, biological and social systems. We may be vastly underestimating the true costs of 'business-as-usual' and underestimating the benefits to society as a whole of using the resources we have inherited efficiently. ■

Dr Paul Epstein is Associate Director of the Center for Health and the Global Environment at Harvard Medical School, Cambridge, USA.

Top left: BSE in cattle, now affecting humans, is just one of many new emerging diseases
Bottom left: People displaced by drought, Chad - unstable weather patterns are increasing
Left: Rats and other rodents thrive in degraded environments
Above: Flooding, Khartoum
Right: Mother nursing her malaria-stricken child

Mark Edwards/Still Pictures



The chemical juggernaut

Man-made chemicals pervade and support every aspect of modern living. But are they also 'elixirs of death', the symbol of our own destruction, as forecast by Rachel Carson in *Silent Spring*? The question is discussed here by **Deborah Cadbury**, author of a new study into *The Feminization of Nature*.

James Holmes; Hays Chemicals/Science Photo Library

The chemical industry is one of the commercial success stories of the 20th century. There are now over 100,000 man-made chemicals in every day use. Many more new compounds are created each year. According to some estimates, the chemical industry has become such a powerful force in the global economy, sales of synthetic chemicals and products derived from them constitutes well in excess of a third of the world's gross national product.

However, recent scientific evidence has revealed an astonishing and unexpected twist to this phenomenal success story. Laboratory tests have shown that a number of chemicals in common use possess a remarkable property. *They can weakly mimic, or modify the action of human hormones.* Hormones are the most potent chemical messengers in the body because they act directly on the genes, instructing our cells how to behave and controlling critical body functions. In the foetus, they appear to be more important still, programming development and directing cells to differentiate into the different organs.

New evidence has shown that some chemicals found in plastics, pesticides and industrial products, are weakly oestrogenic, modifying the action of the female hormone; others can affect the male hormone, the androgens, or anti-androgens; others are thought to target different hormone systems, such as the thyroid and adrenal glands. More frightening still, these are chemicals which we may be eating, drinking, breathing, and bathing in. They are chemicals which no human infant escapes, sometimes even from before birth. Scientists have measured some of them in our own body tissues: our saliva, blood, breast milk and fat.

Alex Bartelt/Science Photo Library

Increasingly, scientists are questioning the impact of these background levels of chemicals on human health. Research from an entirely different field first sparked the debate. In the late 1980s, Professor Niels Skakkebaek, a specialist in male reproductive health at Copenhagen University Hospital, was becoming concerned at the rising incidence of testicular cancer.

"In Denmark we now have 300 per cent more testicular cancer than we had 50 years ago," he observes. "The average increase in Western countries is 2-4 per cent per year over several decades, making this now the commonest cancer in young men."

His team also found some evidence of increases in abnormalities in the male organs of baby boys: testicular

non descent and hypospadias. More worrying, the Copenhagen team uncovered a startling decline in human sperm counts. Analysing over 60 studies world-wide, the data suggested sperm counts had fallen by as much as 50 per cent in the last 50 years.

Working with Dr Richard Sharpe, from the Medical Research Council's Edinburgh Reproductive Biology Labs, in 1993, Professor Niels Skakkebaek went on to propose a remarkable hypothesis. They found oestrogen could play a more important role in the development of the male reproductive tract than was previously thought. By altering the extraordinarily delicate balance of hormonal cues necessary for healthy development, excessive oestrogen exposure may affect when the testes descend, masculinization of the reproductive tract, the development of the urethra and even determine sperm out-put in later life. By affecting cell division, it could even create abnormalities that would predispose to testicular cancer later in life. Was it possible, they asked, that widespread exposure to oestrogenic chemicals could affect the development of baby boys in the womb?

Animal studies have confirmed the plausibility of their hypothesis. Rats exposed to trace quantities of the oestrogenic chemicals, bisphenol A, octyl phenol and butyl benzyl phthalate, while in the womb had more than a 10 per cent reduction in sperm counts and testis size as adults. Accidental human exposures also revealed the same pattern of reproductive disorders. However, Sharpe and Skakkebaek point out that an increase in oestrogen exposure in the last 50 years can also arise in other ways, such as through alterations in life-style and diet and the

John Paul Kay/Still Pictures

Far left: Industrial production of chlorine
Left: Five-month-old human foetus
Above: Pesticide spraying, California

Killing pests - and people

"Evidence indicates that hundreds of millions of farm workers, farm households and consumers are probably exposed to dangerous levels of pesticides."

That is the conclusion of a study by a research team from the Washington-based World Resources Institute, led by Robert Repetto and Sanjay Baliga, into the health consequences of the $30 billion pesticide industry.

The report found that while the bulk of the spending takes place in the United States, Western Europe and Japan, nearly half of the active ingredients by weight are used in developing countries – much of these being the older, cheaper and more dangerous pesticides such as DDT and other persistent organochlorines.

In 1995, over 70,000 tons of organochlorine pesticides were applied in developing and former socialist countries.

It is not only farm workers who are affected, as biological studies show. "The presence of persistent bioaccumulative pesticide residues in foods, body tissues and human breast milk indicates that consumers far removed from agricultural operations can also be significantly exposed."

While studies found that 10 to 30 per cent of farm workers in Latin America showed damage to their neuro-muscular system as a result of pesticide poisoning, only 10-15 per cent of pesticides reach their target on the farm. The rest is dispersed through air, soil and water, some of it only over many years.

Some of this gets into animal dairy products, for example, so that in parts of Mexico and Argentina, most butter and cheese contains pesticide residues. Research among Canadian Inuit people found contaminated fish and marine mammals were affecting breast milk and depressing the immune system in babies, laying them open to infections, including meningitis and inner ear infection.

Research also shows that many organochlorine, organophosphate, carbamate and metallic pesticides affect the immune system of animals and humans, exposing farmers to cancers. Pesticides are also associated with other health disorders, including infectious diseases which may or may not be associated with alterations in the immune system.

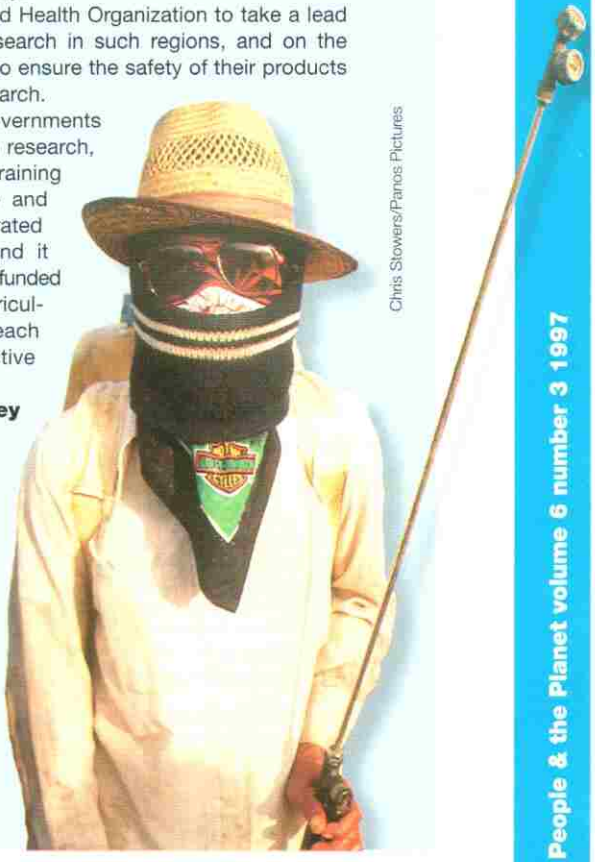
"There is reason to be especially concerned about the immunosuppressive effects of pesticides on exposed populations in the developing countries" where people are much more vulnerable to infectious and parasitic diseases and where many people have weakened immunological defences, the report says.

It calls on the World Health Organization to take a lead in epidemiological research in such regions, and on the pesticide companies to ensure the safety of their products and join in health research.

It also calls on governments to expand their health research, regulatory controls, training in safe pesticide use and development of integrated pest management. And it suggests this could be funded by a small levy by agricultural ministries on each kilogramme of active ingredients used.

John Rowley

Pesticides and the Immune System: the Public Health Risks. WRI, 1996. WRI Publications, PO Box 4852, Hampden Station, Baltimore, MD 21211, USA. Tel: 1-800-822-0504 or 410-516-6963 for Visa or MasterCard orders.



Chris Stowers/Panos Pictures

Mark Edwards/Still Pictures

case against chemicals is not yet proven.

In fact, although the sharp rise in testicular cancer in the West is not in dispute, scientists cannot yet agree on whether sperm counts have fallen. Dramatic declines in sperm counts have been reported in Denmark, France, Britain, Finland and Belgium, but not in New York and some other parts of America. These studies have highlighted the complexity of the issue. In the words of one British Government report, while oestrogen hypothesis must now be regarded as 'plausible,' proof is likely to be 'elusive'.

Similar concerns arise in studies of breast cancer in women. This distressing disease has increased dramatically during the last 50 years, from one in 20 to approximately one in 12 in Britain and one in nine in America. Scientists suspect that oestrogenic chemicals may play a role for several reasons.

Firstly, breast cells are primed to respond to oestrogens and there are many oestrogen receptors in breast tissue. So if oestrogenic chemicals can act as 'pass keys' and fit the receptor just like the women's natural oestrogen, oestradiol, it is at least plausible they could exert effects. It is widely accepted that a woman's life-time exposure to oestrogens is an important risk factor for breast cancer.

Secondly, many man-made chemical oestrogen mimics appear to target fatty tissue such as breast tissue and can be stored there, sometimes for years. Indeed, studies show that compounds, such as DDT and certain PCBs may reach levels 200 to 300 times higher in fatty tissue in the breast, than in blood: levels that are much higher than circulating levels of the natural hormone oestradiol.

Thirdly, it can be shown in the laboratory that some breast cancer cell lines will only grow in the presence of oestrogens; this is used as a test of the potency of a chemical.

Despite such clues, studies on those with breast cancer are not clear cut. Professor Mary Wolff at the Mount Sinai School of Medicine in New York was one of the first to investigate a possible relationship between DDT and breast cancer. In a study of 58 women with breast cancer matched to the same number of controls she found those with the highest 10 per cent of exposure to DDT had about a four-fold risk of breast cancer. But not all studies have revealed such a link, say critics such as Professor Stephen Safe from Texas A & M University.

BBC

Wolff and others agree that there are still a great many unknowns and argue that the relationship between the chemicals and breast cancer may not be simple. Breast tissue may be exposed to a cocktail of different chemicals and attempts to link increased risk of breast cancer to individual chemicals could be of limited value. What is more the timing of the dose may be more important than the amount. All of these factors make the epidemiology hard to assess.

Animal studies have also linked chemical exposure to another serious disease that is on the increase: prostate cancer. Professor Frederick Vom Saal at the University of Missouri has found that prenatal exposure to the synthetic oestrogen, diethylstilbestrol, can permanently sensitize organs such as the prostate glands in a developing foetus, predisposing to prostate disease later in life. Scientists have even linked exposure to PCBs and other persistent contaminants to immune problems, learning and behavioural difficulties. Is it possible, asks Dr Theo Colborn of the World Wildlife Fund, Washington, that whole societies are being subtly and insidiously undermined by chemical exposure?

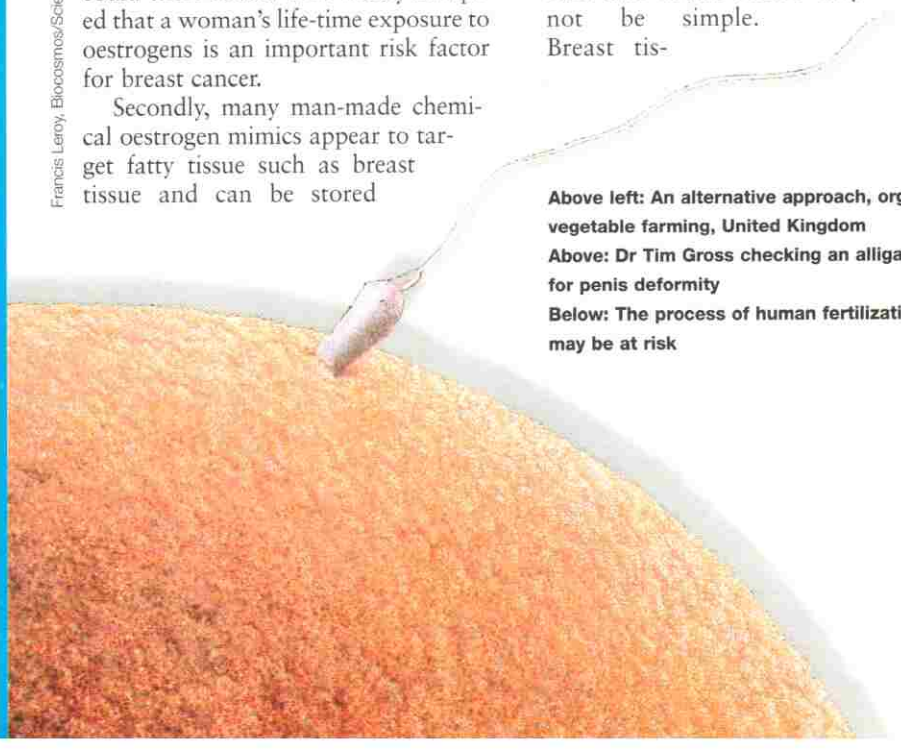
In summarising what could be at stake and the choices that we have, Dr Devra Lee Davis, former Deputy Health Policy Adviser to the American Government, likens this situation to a bargain with Faust. "It's as though we have unwittingly struck the ultimate Faustian bargain. In return for all the benefits of our modern society and all the amazing products of modern life, we have more breast cancer, more testicular cancer. We may also affect the ability of the species to reproduce. I don't accept that bargain. The stakes are too high here, we cannot afford to take a course of action that will affect the ability of the species to persevere."

So are these chemicals the 'elixirs of death,' the symbol of our own destruction, forecast so eloquently by Rachel Carson in *Silent Spring*? Or is this little more than man's inventiveness being one step ahead of safety: a matter which can be easily remedied with a few regulations?

Despite a world-wide debate, the significance of the new findings for human health are still not known. For some, given the usefulness and pervasiveness of the chemicals it would be irresponsible to ban them until we have further data. For others, given what we know now, it would be irresponsible *not* to ban them. This situation calls for an

Francis Leroy, Biocosmos/Science Photo Library

Above left: An alternative approach, organic vegetable farming, United Kingdom
Above: Dr Tim Gross checking an alligator for penis deformity
Below: The process of human fertilization may be at risk



international treaty, argues Dr Theo Colborn and her colleagues. Just as governments united to deal with ozone depleting chemicals in the Montreal Protocol of 1987, a similar worldwide treaty is needed to control the use of the persistent hormonally active chemicals.

As with many complex environmental issues science can highlight trends, but cannot provide black and white answers. This could be the ultimate scientific *cul de sac*. For the longer we wait to gather the evidence, the harder it may become to put things right. "In the long term game called evolution there are unpredictable winners and losers," warns Professor Carlos Sonnenschein at Tufts University, Boston. "It would not be too clever for humans to inadvertently load the dice against their own chances." ■

Deborah Cadbury is an award-winning producer and journalist for the science strand, Horizon, BBC TV. Her new book, *The Feminization of Nature*, (Hamish Hamilton, £20.00 hb, followed by Penguin paperback later this year), tells the alarming story of hormone disrupting chemicals and their possible effects on wildlife and human health. (See review on page 30).

Rob Visser/Environmental Images

Above: Beached male dolphin covered with a chemical-induced green fungus, South of Port Clear, Mobile Bay, Alaska

Poisoning the purity of the Arctic

Startling new evidence that the world acts as a giant distillery may explain alarming concentrations of toxic chemicals in the Arctic. A hitherto undiscovered natural process seems to pick up the chemicals where they are used and dump them, thousands of miles away at the Poles.

Scientists have long been puzzled by the fact that some of the world's most remote peoples are among the most contaminated by polychlorine biphenyls (PCBs) and pesticides. The 450 people of Broughton Island, off Baffin Island, for example, have the highest levels of PCBs in their bodies found anywhere in the world, except in victims of industrial accidents. Greenlanders contain more than 70 times as much of the pesticide hexacholobenzene (HCB) than people from temperate areas of Canada.

Up to now they have thought that the peoples of the Arctic must receive the high levels of the toxins from eating a lot of contaminated fish and wildlife, which will have accumulated the chemicals because they are at the top of the food chain. *Our Stolen Future*, the book which caused a sensation last year by exposing the extent of pollution by oestrogen mimicking chemicals and other 'endocrine disrupters', devotes a long passage to a fictionalized, and implausible, account of how this might happen.

But clearly this cannot wholly explain the phenomenon. Quite apart from anything else the chemicals are widespread in the environment itself, as well as in the fish and wildlife. The pesticide HCH, for example, is over 100 times more concentrated in the Beaufort Sea in the Arctic than in the Java sea near where it is mainly used.

Increasingly scientists now think that 'global distillation' is responsible. Volatile chemicals – like PCBs, HCB and HCH – boil off into the air where they are used in the tropics and are carried thousands of miles by the winds: this happens, for example, to an estimated 99.9 per cent of the HCH used on rice paddies in South India. When the chemicals meet colder air they condense and fall to earth.

As in the fractional distillation equipment used in industry – and in the classroom – different groups of chemicals condense out at different temperatures. Toxaphene, for example, is less volatile than some of the others and seems to accumulate mainly in temperate areas: high levels of the pesticide are found in north sea fish even though it has rarely been used in Europe. HCB, HCH and the more volatile PCBs seem to carry on up to the Arctic; concentrations in seals increase as you go North.

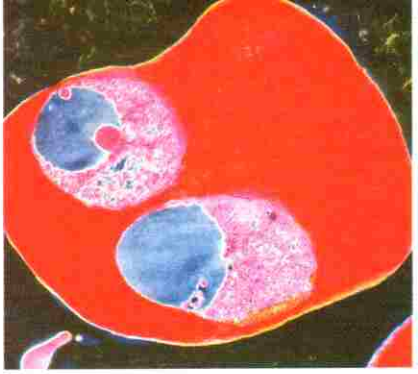
Dr Frank Wania, who first stumbled across the process at the beginning of the 1990s when studying for his doctorate, says that the process can take anything from a few weeks to decades: a single favourable wind can carry the chemicals to the Arctic in a fortnight, or they may move in a long series of countless small jumps as the seasons change.

They concentrate in the Arctic because it is a relatively small area, and the cold and winter dark slow down their natural degradation. And thus the people of the Arctic, who have contributed almost nothing to the pollution and do not benefit from the use of the chemicals thousands of miles away, become its principal victims.

Geoffrey Lean

Geoffrey Lean is Environment Correspondent of the *Independent on Sunday.*

Roland Seitre/Still Pictures



CNRI/Science Photo Library

Dr Rudi Slooff is a leading expert on climate change and human health, and co-author of the latest international assessment of the problem. He works at the World Health Organization as a consultant with the Office of Global and Integrated Environmental Health, in Geneva, where **John Bland** interviewed him for *People & the Planet*.

'Malaria is creeping up th

WHO/Geneva

Only 13,000 years ago, much of northern Europe groaned under the weight of glaciers. Human life was virtually impossible there, and only over the following centuries did our ancient ancestors feel able to edge northwards into lands that had been abandoned to the ice for some 10,000 years. If today the temperatures everywhere are rising, ice-caps are melting and sea-levels rising, may this not be merely a further swing of the geophysical pendulum towards a Tropic Age. Or is it All Man's Fault? I put this question first to Dr Rudi Slooff.

Dr Slooff: Meteorologists who in recent years have studied the interaction of greenhouse gases with global climates have of course taken into account the natural fluctuations in global temperature and atmospheric composition. We know, for instance, from fossil ice core analysis that temperatures and carbon dioxide levels fluctuated wildly, but always in tandem, during part of the previous interglacial period, about 100,000 years ago. Nevertheless, not many scientists in this field still believe that the projected changes – in other words, towards a steady rise in temperature worldwide – are simply the result of natural causes.

To what degree is global warming actually happening?

Let us first agree that we define global warming as that part of the greenhouse effect that is attributable to human actions. The Intergovernmental Panel on Climate Change (IPCC) took some seven years – from 1988 to 1995 – to be able to say in its Plenary Session that there is discernible human influence on the climate. Today, based on anticipated future trends in greenhouse gas (GHG) emissions, the IPCC estimates that the global mean temperature will have risen by 1 to 3.5 degrees Centigrade by late next century.

Levels of carbon dioxide in the atmosphere have been increasing ever since the beginning of the Industrial Revolution, roughly from the start of the last century. The rate of increase in those levels during the past decades is accelerating, and humans are clearly releasing into the atmosphere more greenhouse gases, that is, carbon dioxide, carbon monoxide, nitrous oxide, ozone and methane than natural processes can absorb. Not only do we fell the forests which act as a natural sink for carbon dioxide through photosynthesis, but we add to the gases through burning or processing that timber. So the effect of deforestation is doubly harmful.

Of course, contamination of local environments with noxious industrial, agricultural and automotive wastes poses a direct and tangible toxic threat to human biology. In contrast, the emission of most GHGs has no direct toxic consequence for humans but the resulting climate change may alter various ecological relationships that may then impinge on human health.

The warming is brought about by gases accumulating in the troposphere. But suppose there were two volcanic eruptions on the scale of Mount Pinatubo in the Philippines in 1992. Might they not counterbalance everything that mankind has managed to do to the atmosphere?

Well, it's true that particulate matter creates cooling. In Al Gore's book *Earth in the Balance*, he says there was an enormous volcanic eruption in Indonesia in early 1816, and in Europe that year was described as "the year without a summer," when peasants wandered throughout Europe in search of food. But such natural effects don't last. The effect of GHGs is much more permanent.

So what are the likely direct impacts on human health of global warming?

We see, as one main category, heatwaves and extreme weather events. Heatwaves bring in their wake a mortality increase in both the very young and the very old, while there are also psychosocial effects. A couple of years ago, heatwaves in Los Angeles were accompanied by a very steep rise in violence and mindless looting.

Extreme events, such as storms and floods, are obviously more difficult to predict in terms of effects. Some climatologists believe we shall see more of them! Insurance statistics show that more extreme events are already happening. Cyclones wipe out huge numbers of people and millions of acres of crops; yet people live in low-lying delta areas, such as Bangladesh, precisely because the huge river silt

deposits are very fertile. People sometimes have nowhere else to go.

What are the likely indirect effects of climate change?

The main indirect effects will be the spread of infectious diseases, including those carried by insects and other vectors, damage caused by aggravated air-pollution and by exposure to more ultraviolet radiation (UVR), and the loss of food security. Malaria is already a huge problem, and we see clearly that it is creeping up into mountain areas in such countries as Kenya, Papua New Guinea, Ethiopia. The mosquitoes are now transmitting disease above 2,000 metres, where people have hitherto not been taking precautions against malaria nor against dengue fever, so both diseases are evidently spreading.

Tuberculosis and water-borne diseases like cholera are less influenced by climate change, and more by inter-human contact and polluted water supplies. We have come across a hypothesis that cholera distribution depends in part on *Vibrio cholerae* attaching itself to plankton. And since satellite observations show that algal blooms are exploding all over the world as sea surface temperatures rise, they and the related plankton can contribute to cholera epidemics. Emerging diseases too may be favoured. For instance, hantavirus pulmonary syndrome appears to be transmitted from rodents. The Midwest United States suffered an outbreak when the rat population boomed after a wet year followed six very dry years which had virtually killed off vegetation and rodent predators.

As regards food security, 350 million people are already dependent on permanent food aid. Their lands are becoming demographically denser, the amount of arable land is declining, and with climate change and shifting rainfall patters, there is a high risk of even more frequent crop failures. But let me make it clear that I don't believe the climate can be blamed for everything. Human mobility and the mobility of food – foodstuffs transported all over the world – all contribute to the spread of diseases.

Are certain populations likely to be more affected than others?

In poor or densely populated developing countries, people will to some extent get "more of the same" – infectious diseases, food insecurity. Other countries may expect new problems from emerging diseases, ecological changes and increased UVR. There may be an increased influx of refugees in some places. Low-lying islands in the Pacific and Indian Oceans and coastal cities are exposed to sea-level rise; a rise of 10 to 12 centimetres has been recorded for this century.

Then there is the risk of the permafrost melting or moving deeper, as in Siberia or Alaska where high buildings have been planted on it. Moreover, the permafrost contains great quantities of methane gas which, as a greenhouse gas, could spark off a positive feedback if it were to be released. There may be some benefits from climate change too – winters that are less severe, greater food harvests at higher latitudes or altitudes.

Are there dangers of increased conflict as a result of dwindling resources and population displacement?

We are already seeing this happening today and there is no reason to suppose such problems will go away. Climate change, however, is only one contributory factor. Rwanda is a case in point.

What can be done to combat existing and future public health problems arising from climate change?

We should first think of strengthening our capacity to deal with present-day problems; that will take care of many future problems too. It will be fatal to do nothing. We should do whatever is possible to prevent climate change by bringing GHG emissions down. The United Nations Framework Convention on Climate Change (UNFCCC) which originated at the UN Conference on Environment and Development in Rio de Janeiro in 1992 and has now been ratified by 156 countries, calls for the reduction of all national GHG emissions to 1990 levels by the year 2000. That won't be easy. But if this is simply done country by country, that merely perpetuates the inequitable poor-rich gap. On a per capita basis, the United States uses 10 to 20 times as much fossil fuel as most Third World countries, which cannot afford the cost of installing GHG-free technologies overnight. There has to be 'redistribution', meaning that the developed world must reduce GHG emissions more while accepting that developing countries will reduce less, or are even allowed to increase them. The European Union has recently proposed a GHG reduction scheme based on these principles.

What else is the international community doing about all this?

WHO, the World Meteorological Organization (WMO) and the UN Environment Programme (UNEP) have just published *Climate Change and Human Health*, a 300-page comprehensive assessment of the current situation and of future projections. Its purpose is "to assist and promote further international collaboration aimed at improving our understanding of how climate variability and climate change affect human health so that .... preventive and protective action can be taken."

e mountains as the earth warms'

In particular it examines: the potential adverse health impacts of summertime heat stress, the beneficial effects of milder winters upon cold-related mortality; the complex ways in which climatic change would affect the potential transmission of vector-borne diseases, and the likely increased occurrence of water-borne and food-borne infections; the potential impacts of climate change upon agricultural productivity: possible changes in extreme weather events, such as heat waves, floods, storms and droughts, and how these would affect human health; the impacts of sea level rise on the health of vulnerable populations; and potential health effects of increased ground-level exposure to UVR.

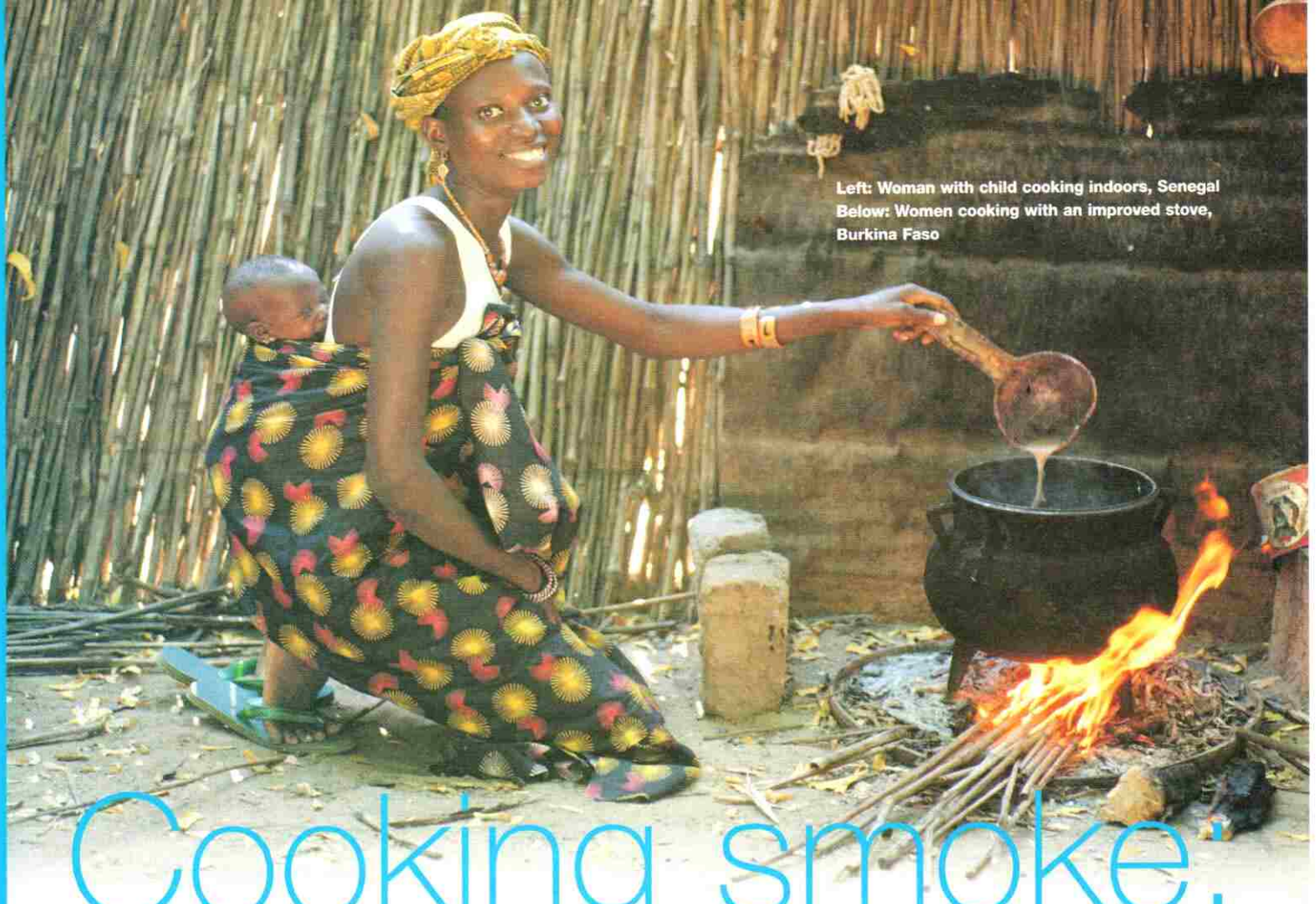
This book is already a source of inspiration for negotiations taking place under the UNFCCC. Member states now need concrete advice on the handling of public health issues associated with global climate change. Scientists need data from other countries and guidance on research priorities.

That's why we have now proposed to set up an Interagency Network on Climate and Health. This embraces WHO, WMO and UNEP and it aims to help countries to find ways of making national assessments of the climate -health relationship through training, raising awareness, and pilot studies. It also aims to create a database as the address to which all member states can turn for information and to act as consultants in a fast-moving scene which is going to need a great deal of applied research in a huge number of fields.

Providing such services is very much in line with WHO's role in environmental health, which is to help to monitor trends, to support research activities, to set standards, to facilitate data exchange and to offer training in health risk assessment and environmental epidemiology. ■

John H. Bland is former Editor-in-Chief of WHO's illustrated magazine *World Health*.

Climate Change and Human Health is available from Distribution and Sales, WHO, CH-1211 Geneva 27, Switzerland, price Sw.fr. 30 or US$ 27 (in developing countries Sw. fr. 21) Fax: +41 22 791 4857 *or* Email: publications@who.ch



Left: Woman with child cooking indoors, Senegal
Below: Women cooking with an improved stove, Burkina Faso

Cooking smoke: a silent killer

Billions of dollars have been spent on research into the harmful effects of cigarette smoke and outdoor air pollution has become a major concern in many countries. Comparatively little has been done to protect human health from indoor air pollution, as **Dietrich Schwela** reports.

Wood, stubble, dung and grass are used daily in about half of the world's households as energy for cooking and heating. In most parts of the Third World they are burnt in open fires or inefficient stoves in poorly ventilated kitchens. The result is a toll in death and ill health far greater than the more often discussed outdoor air pollution.

Mark Edwards/Still Pictures

Biomass smoke contains many harmful constituents such as respirable particulates and carbon monoxide (CO), exposure to which can cause or contribute to acute respiratory infections (ARI), pneumonia, tuberculosis, lower birth weights, cataract, and nervous and muscular fatigue. Smoke, especially coal smoke, also contains sulphur and nitrogen oxides and hydrocarbons which can lead to cancer. Women and children are most exposed to high levels of harmful smoke and suffer the most serious health damage; respiratory infections alone cause between 4 and 5 million deaths per year among small children, which is equal to or marginally less than deaths from diarrhoeal diseases.

WHO has estimated that about 2,500 million people in the world are exposed to excessive levels of indoor air pollution, largely due to burning biomass and coal indoors in ovens that are badly designed and lack proper chimneys. Some 1.9 million additional deaths each year are blamed on rural indoor pollution through suspended particulate matter and another 450,000 deaths are attributed to urban indoor air pollution. These figures are over and above the 500,000 excess deaths worldwide due to concentrations of suspended particulate matter and sulphur dioxide in the atmosphere.

African countries and India have the worst record for suspended particulate matter in rural homes, while Latin America, India again and China are worst for suspended particulate matter in urban interiors. Again, most monitoring is being carried out on ambient (outdoor) air, whereas many health problems potentially linked to indoor air pollution still go unrecognized. For example, several studies in China

Ron Gilling/Panos Pictures

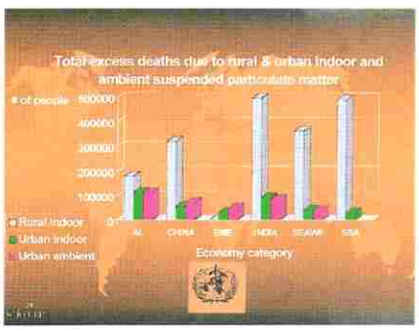
found that coal smoke was a strong risk factor for lung cancer among non-smoking women, while another study in Japan has related lung cancer to the past use of biofuels in cooking. In Gambia it was found that girls aged under five carried on their mother's back during cooking (in smoky cooking huts) had a six times higher risk of ARI – a substantially higher risk factor than if their parents smoked.

At the 7th International Conference on Indoor Quality and Climate, "Indoors Air '96", held in Nagoya, Japan, last July, participants were told that a shift of focus was needed to ensure that the health hazards from indoor air pollution were accorded the importance they deserve. This series of conferences – which started two decades ago – will continue with "Indoor Air '99" in Edinburgh in August 1999.

Smokeless stoves

Unfortunately, while the health problems are all too clear, the solutions are as many as grains of sand in the desert. The issues involved are culturally diverse since they relate to such basic traditional patterns as how people live and cook and eat. The literature abounds with designs for 'simple' smokeless stoves or 'elementary' chimneys, hoods and smoke removal appliances. But persuading people to build, install, maintain and use such devices *en masse* is a thorny issue; indeed the first step is probably to persuade the millions exposed to biomass smoke that it does actually pose a health hazard.

Although carbon dioxide, the principal gas produced by biomass combustion, is the best-known greenhouse gas, it is by no means the only one. Essentially, all the products of incomplete combustion produced by biomass fires with less than 100 per cent efficiency (virtually all of them) are also greenhouse gases, and include methane, carbon monoxide and non-methane hydrocarbons. It is the products of incomplete combustion, mostly in the form of carbon monoxide, particulates and gaseous organic compounds that comprise the chief health-threatening materials in coal and biomass smoke.



The WHO Air Management Information System (AMIS) has recently been initiated to report trends in air pollution concentrations in many of the world's mega-cities. But much additional research is also needed on the relationships between indoor smoke and respiratory diseases, and on the linkages between housing design, fuel, stoves, water, food and health – taking into account social, economic and cultural factors as well as the appropriate technologies that are locally available.

At present, great emphasis and attention is placed on controlling industrial emissions, prevention of air pollution from road traffic through far-sighted transport policies and urban planning, the phasing out of leaded petrol and obligatory emission control in new cars. But no less effort needs to be put into the actions required to reduce indoor air pollution both in cities and in villages. ■

Dr Dietrich H. Schwela is a scientist with WHO's Urban Environmental Health Unit (UEH), Division of Operational Support in Environmental Health (EOS) in Geneva.

Improved stoves halve chest and eye disease

A 1993 study in Limuru area of Kenya showed that acute respiratory infection (ARI) and conjunctivitis is lower in households using an improved jiko stove than in those households using the traditional three-stone stove, *writes Isabel Mbugua.*

Neil Cooper/Panos Pictures

Looking at a one-week prevalence among young children and mothers of the two health conditions, the study found ARI to be 23 per cent in the households using the jiko stove, compared to 59 per cent prevalence in households using the traditional stove. Households using the traditional stove were 2.5 times more likely to have children with conjunctivitis.

The Stoves and Household Energy Programme of the Intermediate Technology Development Group (ITDG) in Kenya collaborates with the government, bilateral agencies and women's groups to promote the use of improved stoves, which are more efficient, use less firewood and emit less smoke.

"We look at the issues from all angles and we do not simply go to a community and sell the stove idea. The programme usually will marry the stove technology with other ideas and concepts that will help a given community evaluate their energy needs and how to meet these locally," says Stephen Gitonga of ITDG's regional Household Energy project.

Gitonga's major responsibility since 1994 has been to share the experiences from Kenya's activities in the energy sector with other partners in the region.

"Over the years we have done a lot of research on stove production and use – from clay selection to mixing, design as well as use of chimneys, hoods, ventilation and improved kitchens. This is what we hope to disseminate in the rest of the countries of the region," says Gitonga.

According to the ITDG 1996 Annual Report, "over 30 partners have received some form of technical assistance. Through the provision of information and training, their capacity to implement effective household energy programmes has been significantly enhanced. It is hoped that by developing local capacities the project has reached more people than if IT were implementing activities directly."

Gitonga feels that household smoke as a pollutant needs to be addressed at all levels.

"When you look at it, the improved stove is a concern of those interested in health care of women and children; it is a concern for those interested in conservation of trees; it is a gender issue because it is women who spend most time in the smoky kitchens, causing their health to suffer, and women spend hours looking for firewood."

Isabel Mbugua is Kenyan journalist who specializes in development issues.

Last Word:

Prisoners of poverty

The problem of health and the environment may not be solvable without tackling poverty, says **Greg Goldstein**.

The subject of poor people in crowded settlements is bedevilled by a profound lack of interest. Yet, unless a major investment is made to ensure that all human beings are able to obtain the necessities of a decent life 'health for all' may remain no more than a slogan.

Attention may be given to settlements when a new type of epidemic disease threatens; when water shortage looms; or when the level of violence crosses various thresholds. Every type of human misery from crime to drugs to epidemic disease finds fertile soil in low income or squatter settlements and 'peri-urban septic fringes'. But strangely, the poverty and vulnerability represented by the world's poor settlements are tolerated and even exploited. Such conditions are accepted almost as naturally ordained.

Today, we live on a planet which increasingly represents not 'one world', but 'two worlds'. The 'two worlds' result in part from the failure of growth in more than 100 countries. As the UNDP Human Development Report 1996 indicates, these countries' per capita income is lower than it was 15 years ago, and, as a result, more than a quarter of humanity – 1.6 billion people – are worse off today than they were 15 years ago.

A connection between advanced technology and scientific capacity to the desperate and degrading living conditions of poor citizens is never made. As a Spanish colleague who marvels at the wonders of science has noted "Why then don't we live with more dignity? Is there a Black Hand upon us?"

Mounting inequality

In 70 developing countries, today's levels of income are less than those reached in the 1960s or 1970s. In 1997, per capita income is less than it was in 1960 or before. Economic decline in much of the developing world has lasted for longer and gone deeper than the Great Depression of the 1930s.

Poverty and income gaps have grown amidst economic growth. The World Bank recently estimated that 1.3 billion people live – or survive – on less than a dollar a day. The number of people with incomes of less that $750 per year, hardly more than $2 per day, is about 3.3 billion people, or 60 per cent of humanity. We live in a world where between 1960 and 1993 total global income increased by six-fold to $23 trillion, and where average world per capita income tripled, but where three-fifths of humanity still lives in a prison of poverty.

Poverty and health

In many countries during the last two decades, the ratio of the share of income of the richest 10 per cent to the poorest 10 per cent of the population more than doubled. In Thailand, for example, it grew from 17 times to 38 times. And today, in the United States, the share of total assets owned by the richest one per cent of the people has almost doubled from 20 per cent to 36 per cent since 1975. In countries like Brazil and Guatemala the richest 20 per cent earn more than 30 times the poorest, and even in the United States, the United Kingdom, Switzerland and Australia, the difference is about ten-fold.

During the last three decades, the ratio of the income share of the richest 20 per cent to that of the poorest 20 per cent has more than doubled from 30:1 to 61:1. The poorest 20 per cent saw their share of global income decline from 2.3 per cent to 1.4 per cent over the last 30 years.

The last few decades have seen evidence accumulating about relationships between poverty and poor health. In an important new analysis that draws on recent research from many disciplines, Richard Wilkinson has shown how the effects of poverty are mediated through low social cohesion, marginalization of poor people, and lack of social participation[1]. The startling possibility has emerged that the serious health problems of poor people are not only the result of a lack of clean water, a decent house, sanitation and basic services. They also result from despair, anger, fear, worry about debts, worry about job and housing insecurity, feelings of failure and social alienation.

He shows for example that the decline in social cohesion in Eastern Europe in the 1970s and 1980s is clearly related to the widening East-West mortality gap. The conclusion is that chronic stress – arising from social exclusion and devaluation as a human being – may be as damaging to health as the dangerous housing and working conditions poor people experience.

Polarization, increased inequality and profound poverty not only violate basic principles of justice and fairness, they breed alienation, despair and crime. More egalitarian societies connect people through a variety of social organizations, purposes and activities. The necessary contribution of poor people to sustainable development may never be realized without major investment in their development. If ambitious agendas on conservation, energy, food, women and ecological city planning are ever to be achieved, the first step may be to develop the conditions whereby social cohesion and social purpose are possible.

New global agenda

The desperate problems of urban infrastructure and services have implications not only for poor countries or African countries. A new global agenda (funded by wealthier countries) to solve the settlements problems in all countries may be in the best interest of wealthier as well as poorer countries.

Gradually it is becoming clearer that 'globalization' does not only involve trade and communications, but also

Rod Johnson/Panos Pictures

many types of important social and environmental issues, including infectious diseases, crime, drug problems and environmental damage. It has not passed unnoticed that diseases such as tuberculosis and cholera, once thought to be eradicated by most high or middle-income countries, are now a threat to many people worldwide, and that their comeback is related at least in part to poor housing conditions and deficient basic services in settlements. Laurie Garrett has argued that the emergence of new diseases such as Ebola virus infection has been facilitated through the presence of unplanned and poorly serviced settlements[2]. Perhaps the question is not "can we afford to provide decent housing and basic services for all humans", rather it is can we – the human species – afford not to?

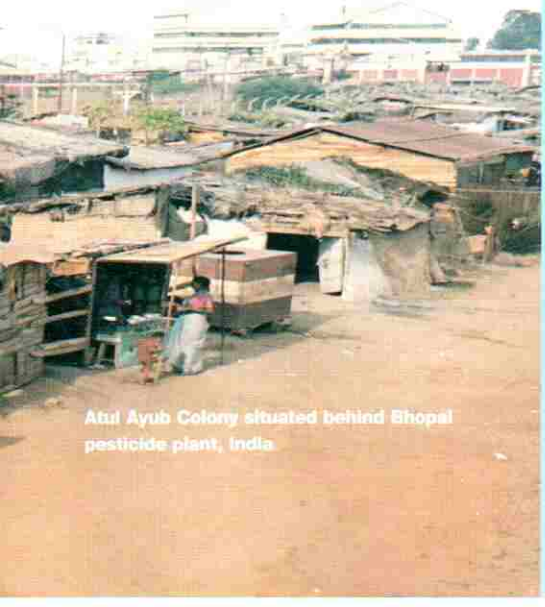
A major international effort is needed to develop our towns and cities in such a way that all citizens can live a decent life – using existing capabilities and technologies. In conference after conference in the last decade of the millennium, ambitious agendas have been developed on sustainable development. But still needed is a greater recognition of the corrosive effect on these agendas of continued and rising inequity on the sense of purpose and social cohesion at global, national and local levels. The global web of trade, grassroots and NGO action, investment, diplomacy, and telecommunications must continue to be strengthened to develop this purpose.

The world's rich minority (the 30 richest countries) represent 78 per cent of the global gross domestic product. Currently the global rich spend only an average of 0.29 per cent of their national income on official development aid. Is such a small figure in their best interest? Effective aid does not depend only on its amount, but also requires action by recipient countries in strengthening the legitimacy, transparency and the accountability of their institutions. ■

Dr Greg Goldstein is Co-ordinator of the Healthy City Programme at WHO in Geneva.

1. *Unhealthy Societies. The Afflictions of Inequality.* Richard Wilkinson, Routledge, New York, 1996.

2. *The Return of Infectious Diseases,* Laurie Garrett, Foreign Affairs, January, 1996.



Atul Ayub Colony situated behind Bhopal pesticide plant, India

Counting the cost

We frequently hear from our political leaders that they recognize the need for environmental safeguards. We hear from them even more that they must also consider competing priorities, especially super-priorities such as inflation, mortgages and jobs. They might heed the calculations of Professor David Pearce, Chairman of Economics at University College London, together with his colleague Dr Giles Atkinson, who have looked at the concealed costs of inaction on the environmental front.

They estimate that problems such as grandscale pollution are costing the British economy a whopping four per cent of the Gross Domestic Product. But not a whisper of this entered into the recent election rhetoric.

Even more remarkable is the collective indifference of politicos right around the world to the unusually positive cost benefits of action against inaction. For instance, desertification costs agriculture some $42 billion a year, whereas the Anti-Desertification Action Plan is budgeted at only $12 billion a year.

The annual cost of workdays lost in developing countries due to water-related diseases is around $125 billion, while the annual cost of supplying water and water-based sanitation is $30 billion. Were smallpox still with us, it would be causing treatment expenses of $300 million every year (1978 value), whereas the 12-year eradication campaign cost only $300 million. Similar cost-benefit ratios could surely obtain for several other major diseases.

Consider too the pivotal role played by fuelwood in the rural economies of many developing countries. Due to fuelwood deficits, rural households divert animal manure and crop residues from farm fields to house hearths, causing a decline in soil fertility and cropland productivity. In developing Asia and Africa alone, at least 400 million tonnes of dung are burned each year; and each tonne means a loss of at least 50 kilogrammes of potential grain grown, or a total of 20 million tonnes of grain per year – enough to feed 100 million people for one year (some analysts calculate the total as twice as much). To purchase the grain on world markets could cost $4 billion.

In addition, fuelwood shortages cause people to spend large amounts of time daily in trekking to find supplies. If we allow just 25 US cents per hour as the value of the time opportunity costs involved, the aggregate cost in Asia and Africa alone amounts to at least $50 billion per year. Yet a comprehensive fuelwood-plantation programme would cost only $1 billion per year for ten years – a figure often regarded as quite unjustified and unavailable.

Or consider forestry as a whole in developing countries. Some 40 per cent of Third World farmers depend upon regular flows of rivers and streams from forested watersheds to irrigate their croplands. The on-site soil conservation benefits of tree cover within India's forests are worth between $5 billion and $12 billion per year, while the nation-wide value of forests services in regulating river flows and containing floods are roughly assessed at $72 billion a year. Perhaps most pertinent of all: what price for watershed services in the year 2025 when a full three billion people in developing countries may well be suffering water shortages?

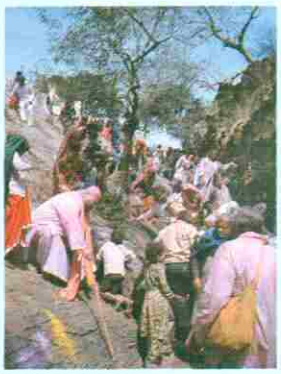
And how do we assess the value of wild forest rice, a single gene from which offered resistance to the 'grassy stunt' virus in Asia in the early 1970s. In India alone, the introduction of wild rice strains (plus primitive cultivars) has increased yields by $75 million a year.

Many other crops – ranging from food crops such as avocado, banana, cashew, coconut, grapefruit and lemon to beverages and spices such as cacao, cinnamon, coffee, paprika and vanilla, and to industrial crops such as oil palm and rubber – depend for part of their productivity and disease resistance on genetic infusions from wild relatives in tropical forests. Just the exports of these crops are worth well over $20 billion a year.

Add to this the many medicinals from tropical forest plants and the stabilizing effect of forests in the global climate system, and we find that tropical forests offer a far higher rate of return than any alternative form of current land use. Alternatively reckoned, to replace the carbon storage function of tropical forests (never mind temperate and boreal forests) could cost $3.7 trillion.

Yet the cost of safeguarding tropical forests need be only a few tens of billions of dollars a year. This would yield a better return on investment than almost anything one could get in the City of London or on Wall Street. Political leaders: can you too do the arithmetic? ■

Dr Norman Myers is a Fellow of Green College, Oxford, and a Contributing Editor of *People & the Planet.*



Robyn Beeche/Circa Photo Library

KRISHNA'S FOREST

Five years after launching a project to restore the sacred forests of Vrindavan, birthplace of Krishna on the banks of the River Yamuna, WWF India has been sufficiently encouraged by the result to make the partnership with religion its main focus nationally.

The main aim of the project, launched in 1991 with a grant of £25,000 from WWF International, was to organize tree planting along the parikrama, the seven-mile pilgrim path which encircles Vrindavan where Krishna, the most environmental of all Hindu visions of God, lived in the forest herding cows and dancing with the cowherd girls.

By involving the local community the newly-planted trees had a survival rate well above 50 per cent, compared with the ten per cent survival rate for trees planted by India's Forest Service. Today, over 3,000 trees have been planted and 30,000 sacred plants have been distributed. Nurseries and plant clinics have been set up, 500 children have been enrolled in nature clubs and part-time 'environment teachers' are busy in all Vrindavan's 35 schools.

The project took on an international dimension with the setting up of the Friends of Vrindavan in the English city of Leicester, and an annual cycle expedition from the Himalayas to Vrindavan. This has raised support funding, to which WWF and the WWF Alliance for Religion and Conservation have also contributed.

Now WWF India has recognised the potent combination of religion and environment and will concentrate particularly on sacred groves, which are to be found across India. Its supporters group has helped to raise £8 million from central state funds which will help spread the Vrindavan model across the country.

The Vrindavan Conservation Project is described more fully in *Hinduism and Ecology* by Ranchor Prime, published by WWF in association with Cassell, £6.99.

AVENTURES ON EARTH

Population Reference Bureau has produced an excellent new teaching kit *Adventures on Earth: Exploring our Global Links* primarily for use with middle and high schools students.

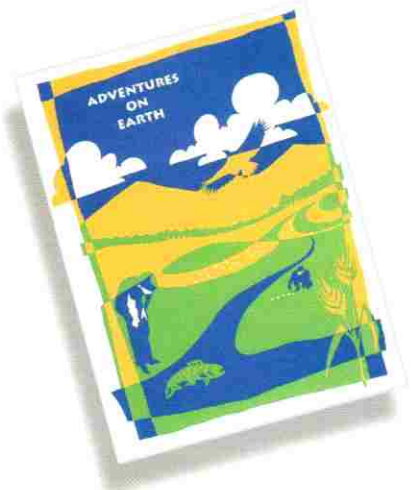
Developed in collaboration with geography educators, this classroom guide uses a series of interactive lessons to help students consider how people use the environment, the factors that effect human resources (demographic, socio-economic, political and cultural), and the impact of human activities on the local and global environment.

Adventures on Earth includes four core lessons, two case studies, and the *1997 World Population and the Environment Data Sheet* which is used throughout the unit.

The core lessons prepare students to consider the relationship between human basic needs, use of resources and production of waste. The lessons are comprehensive and include maps, charts, and handouts.

The case studies enable students to examine how human needs and environmental stress are confronted by real people in real places. The first case study assesses human needs and environmental degradation in Haiti. In the second, students prepare and participate in a mock trial to assign responsibility for the likely consequences of global climate change in Bangladesh.

Strategies incorporated into the lessons include mapping, data collection and analysis, role-playing, organizing information, research, problem solving and decision-making. Students should develop a wide range of geographic skills in the process.



Adventures on Earth is available from the PRB, 1875 Connecticut Avenue NW, Suite 520, Washington DC 20009-5728, USA. Tel: (+1 202) 483 1100, Fax: (+1 202) 328 3937. Price: $10 plus postage ($1.50 or 6 per cent of order, whichever is greater). The data sheet can be purchased separately for $3.50 plus postage.

ANIMAL EXTINCTION

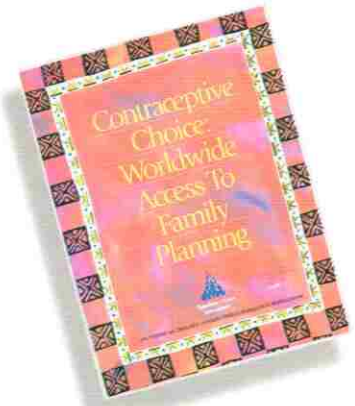
A quarter of all known mammal species are at risk of extinction, according to the 1996 IUCN Red List of Threatened Animals – the most comprehensive scientific assessment of threatened species yet produced.

The 1996 Red List is the first assessment to mark the conservation status of all known mammals. But the report also contains equally grim estimates on other animals: At risk are 11 per cent of all known bird species, 20 per cent of reptiles, 25 per cent of amphibians, and 34 per cent of fish, mostly freshwater species.

Alain Endeweit/Still Pictures

"This scientific assessment is indisputable proof that warnings about global biological diversity loss haven't been exaggerated – if anything we've been too optimistic," said Russell Mittermeier, President of Conservation International and Chair of the IUCN's Species Survival Commission's Primate Specialist Group. "Furthermore, the 1996 Red List is the first study to use rigorous criteria for assessing the conservation status of species, making these grim findings more defensible than ever before."

To produce the 1996 list, 500 scientists provided data and carried out assessments. For the first time, the list has added a "critical" category representing the most endangered of the endangered species – those animals on the edge of extinction. "The Red List is actually a red flag, warning us about the perilous state of animals and drawing attention to threats such as habitat destruction, pollution, over-harvesting, and the introduction of non-native species," said Jorgen Thomsen, Conservation International's Senior Director for Conservation Biology.



LACK OF CHOICE

Poor access and the narrow range of contraceptive methods available in many developing countries are key obstacles to family planning use and to improving women's health, says a new study by Population Action International.

The PAI study, *Contraceptive Choice: Worldwide Access to Family Planning*, highlights the progress made in expanding access to contraceptive methods since 1982, as well as the large gaps remaining. According to the study, more than 100 million married women in developing countries are considered to have an "unmet need" for family planning.

The study ranks 88 developing countries and 39 developed countries, on separate scales, according to the accessibility of contraceptive methods. While the availability of contraception has increased most rapidly in Africa – nearly three-fold since 1982 – couples there still have poorer access to fewer methods, on average, than did couples in either Latin America or Asia more than a decade ago.

Hong Kong, Singapore, South Korea, Taiwan and Tunisia lead developing countries in contraceptive access while Mauritania, Laos, Chad and the Congo are still far behind. Couples in the latter countries still have virtually no access to any modern contraceptive method and maternal mortality rates are the highest in the world.

Germany, New Zealand, Spain, Sweden and Switzerland lead the developed countries and the United States is in sixth place. Armenia is the lowest ranked developed country, behind Japan, Romania, Tajikistan and Ukraine.

The average score recorded by the study for developing countries corresponds to the wide availability of only 2.7 contraceptive methods out of five methods surveyed; in 1982 just 1.7 methods were widely available. For developed countries, the average score corresponds to the wide availability of 4.3 methods, out of six surveyed.

"Access and choice of contraceptive methods are two linchpins of good family planning programmes," says Shanti Conly, PAI's Director of Policy Research and Editor of the study. "Contraceptive choice is fundamental to women's health and represents not only a chance to plan their families, but to plan their lives."

Contraceptive Choice: Worldwide Access to Family Planning, available from, PAI,1120 19th St. NW, Washington DC 20036, USA.
Tel: (+1 202) 659 1833, Fax: (+1 202) 293 1795.
Email: pmsmears@popact.org

SCREENING SOUTH AFRICA

Cervical cancer is among the top five causes of death among women between the ages of 45 and 59 in the developing world. For South African women, cervical cancer accounts for a quarter of the all cancer-related deaths.

The Philani Cervical Cancer Prevention Project, with support from the Association for Voluntary and Safe Contraception International (AVSC), and other institutions, is working to meet a need never before addressed – screening to prevent cervical cancer.

The project is located in a settlement outside Cape Town with a high-rate of sexually transmitted diseases (STDs). Cervical Cancer is linked to STDs, with most cases caused by the human papilloma virus.The project provides education services, screening, and treatment for women at the highest risk (between 30-50 years of age). Philani uses a mobile van parked outside an outpatient treatment centre that houses clinics for family planning, tuberculosis, sexually transmitted diseases, and maternal and child health services.

Since its inception, it has enrolled 1,600 unscreened women. About 9 per cent of clients at the clinic were shown to have abnormalities of the cervix that had the potential to progress to cancer.

For more information contact AVSC International, 79 Madison Avenue, New York, NY 10017, USA. Tel: (+1 212) 561 8000, Fax: (+1 212) 779 9439, Email: info@avsc.org

MEDIA MESSAGES

The producers of the Kenyan radio programme, *Youth Variety Show*, a series which aims to educate and provide young people with information about sexual responsibility and reproductive health, have been honoured with a national award. The award was presented to Mr Godwin Mzenge, Executive Director of the Family Planning Association of Kenya (FPAK), which jointly produces the show with Kenya Broadcasting Co-operation (KBC). The shows co-sponsors include, Johns Hopkins University Population Communication Services (JHU/PCS) and the UN Population Fund (UNFPA), which co-sponsored 20 episodes.

Under the direction of Mrs Eulelia, Head of Radio Programs at KBC, the production team has produced over 50 episodes of the show. Managing Director of Johnson & Johnson (K) Ltd, Mr Davis Kanyama, presented the team with a sponsoring cheque for US$ 5,000 to aid future productions. UNFPA was acknowledged for co-sponsoring 20 episodes of the show.

Las Manitos, Bolivia's National Reproductive Health Programme (NRHP), has won the Population Institute's Annual Global Media Award for Best Advertising Campaign. The campaign, which has the backing of the President and Vice President of Bolivia, is a national multimedia effort involving more than 30 public and private institutions, including IPPF affiliate CIES (Centro Para Investigacion Educacion, y Servicios).

Seven TV spots and 25 radio spots in four languages aired the campaign nationwide every day for three months. Other media efforts included, clinic identification signs, brochures, posters, pins, stickers, T-shirts, and press releases.

The campaign, spearheaded by the Bolivian National Reproductive Health Strategy, received assistance from the Johns Hopkins University of Population Communication Services (JHU/PCS) and USAID.

Contact: JHU, Center for Communication Programs, School of Hygiene and Public Health, 111 Market Place – Suite 310, Baltimore, Maryland 21202 – 4012 USA.
Tel: (+1 410) 659 6300, Fax: (+1 410) 659 6266.

ARCHAIC LAW

Over 150 delegates from 18 Francophone African countries attended the Symposium on Removal of Legal Obstacles to Sexual and Reproductive Health in Francophone African Countries in March.

Organized by the Africa Region of the International Planned Parenthood Federation (IPPF), the meeting discussed the removal of an archaic French law passed in 1920 in the wake of the losses of the First World War which made abortion a criminal offence and prohibited the sale, advertising or manufacture of all contraceptives.

Speakers pointed out that although the law was now a dead letter in many countries, its continuing existence on the statute book was a threat and a discouragement to organizations working in family planning. Governments had given commitments at the International Conference on Population and Development (Cairo 1994) and the Beijing Women's Conference (1995) which endorsed the health benefits of family planning – yet the legislation remained to contradict these positive steps.

Among the recommendations in the action plans prepared by participants from each country are the adoption or amendment of laws to give access to contraception; the need to adopt new legislation and/or review existing laws relating to termination of pregnancy; setting up reproductive health policies and programmes; sexual and reproductive health education in schools and training centres; and advocacy through networking at all levels.

Contact: Africa Liaison Office, IPPF, Regent's College, Inner Circle, Regent's Park, London NW1 4NS, UK.
Tel: 0171 487 7900, Fax: 0171 487 7950, Email: info@ippf.org

Associates' News is compiled by **Maya Pastakia** *to whom all contributions should be addressed.*

Books

SILENT EPIDEMIC

PREVENTING BREAST CANCER:
THE POLITICS OF AN EPIDEMIC

Dr Cathy Read

Pandora, London, 1995, £7.99/$13.00pb

Over half a million women worldwide die of breast cancer each year. This toll has crept up gradually since the early 1950s and is now of epidemic proportions, especially in Europe and North America where more than half the 900,000 women diagnosed with the disease live. Cathy Read's book is indicative of women's fight back against what seems to be an inexorable disease.

Women are not helpless in the face of rising breast cancer rates argues Read: "If the rate of breast cancer has gone up, then it can come down."

The diagnosis of Cathy Read's mother with breast cancer inspired her to write the book. A well-established science writer, she has produce an excellent and accessible reference book which addresses all the potential causes of the disease including age, family history, age of first period and menopause, obesity, a high fat diet and alcohol consumption.

Also tackled by Read are the environmental factors which are often omitted by the medical establishment when explaining the possible causes of breast cancer.

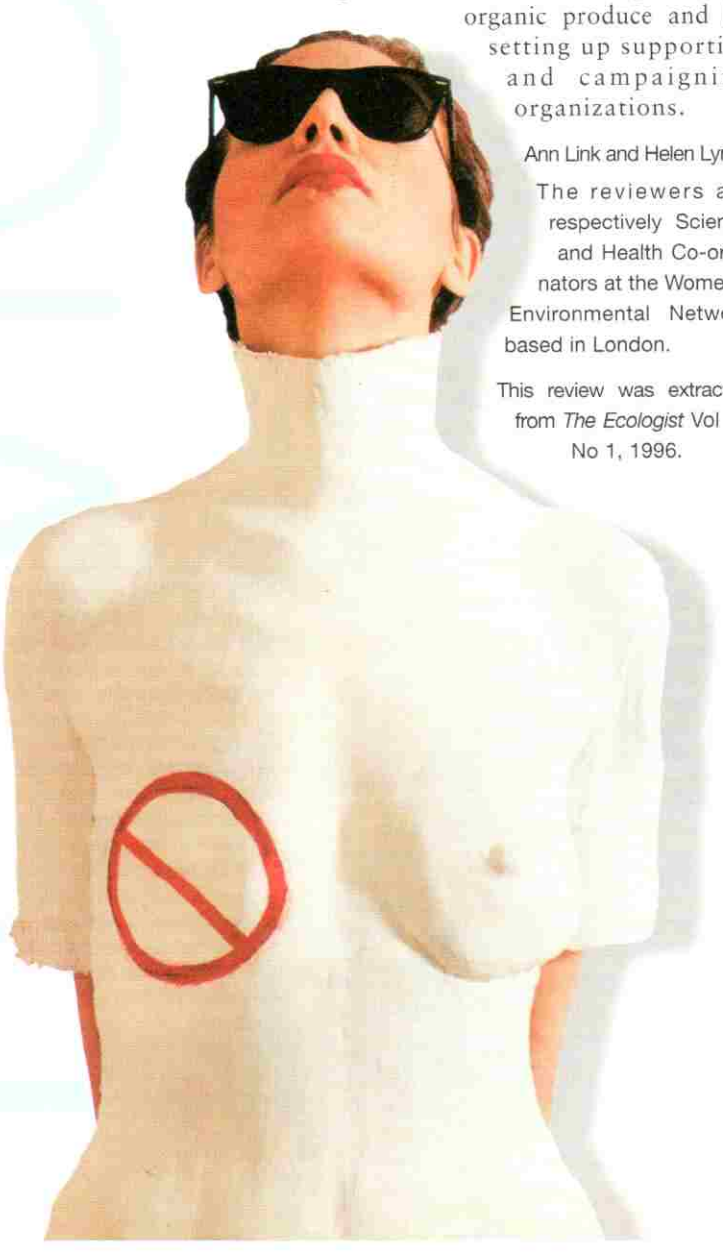
Environmental influences considered in the book include persistent synthetic chemicals including pesticides, especially those which mimic or disrupt oestrogen's action in the body, ionizing radiation, and electromagnetic radiation from power lines, for instance.

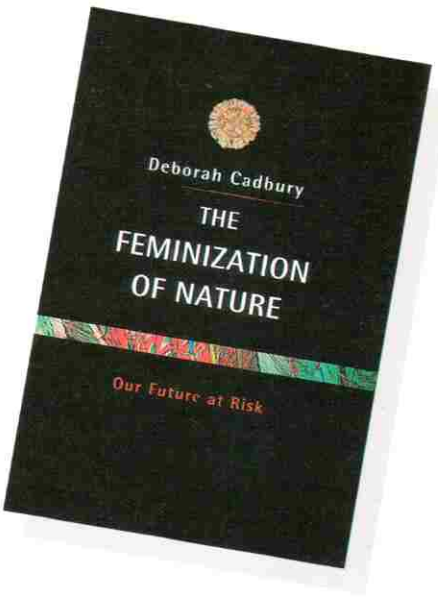
Preventing Breast Cancer puts the disease in its political and environmental context. It empowers women to deal with the causes, as many are beginning to do by campaigning for pesticide-free food and promoting organic produce and by setting up supportive and campaigning organizations.

Ann Link and Helen Lynn

The reviewers are respectively Science and Health Co-ordinators at the Women's Environmental Network based in London.

This review was extracted from *The Ecologist* Vol 26 No 1, 1996.





SEX CHANGE

THE FEMINISATION OF NATURE
OUR FUTURE AT RISK

Deborah Cadbury

Hamish Hamilton, London, 1997, £17.99

This is science journalism of a high order. It is also a detective story that needs telling. Twenty-five years ago a young Danish scientist, Neils Skakkebaek, came across the first clue that something was going very wrong with male reproductive health. He found strange 'empty cells' in the tissues of the testes of infertile men that had never been seen before.

He proposed and later proved, that these cells were the precursors of testicular cancer; a disease which has, grown by 300 per cent in Denmark over the last half century, and which has been growing elsewhere by 2 to 4 per cent a year over several decades. His discovery was the beginning of a scientific trail which began to link other disturbing evidence of adverse changes in the reproductive health of humans and animals.

First came reports that human sperm counts appeared to have fallen dramatically in many countries. Sex abnormalities in boys, including an increase in the incidence of undescended testicles were becoming more common. Cancers of the breast and prostate were also increasing, especially in Europe and America, causing increased speculation about environmental causes.

The environmental connection was given fresh impetus when it was discovered in the 1970s that an oestrogen mimicking drug, DES, given to millions of women to assist their pregnancies and insure against miscarriage had sometimes resulted in terrible abnor-

malities in their teenage daughters, including vaginal cancers, and had also affected the sexual health of some boys.

Taken together with extraordinary changes in the reproductive systems of wildlife, from sex changing alligators in Florida to the "feminization" of fish in British rivers, scientists pieced together the evidence pointing to a common link between all these events: the alterations in exposure to chemicals, which contain or copy the female hormone oestrogen. Synthetic chemicals, which imitate human hormones, are now all round us – in our water, our food and in a myriad of modern-day products from water-pipe linings to plastic bottles and wrappings.

Deborah Cadbury unravels the scientific story in a gripping fashion, with scrupulous care to quote all the conclusions and keep an open mind about the unfinished ending. But her warning of the 'trump card of uncertainty' which provides industry and government with an excuse for inaction is clear enough. Books like this are vital if the informed concern of the people is to make itself felt.

John Rowley

IN BRIEF

OUR PLANET, OUR HEALTH

WHO, Geneva, 1992. Sw.fr.45.

This report of the WHO Commission on Health and the Environment is the standard reader on the subject. It looks, in particular, at food and agriculture, water, energy, industry, and urbanization. It is available for Sw.fr. 20 in developing countries.

URBAN HEALTH IN DEVELOPING COUNTRIES. PROGRESS AND PROSPECTS.

Trudy Harpham and Marcel Tanner (Eds)
Earthscan, London, 1996. £14.95pb

Here are viewpoints from 38 contributors on various aspects of the urban health issue. Heavy going for the general reader, but useful perspectives for those directly concerned.

BEYOND THE SILENT SPRING
INTEGRATED PEST MANAGEMENT AND CHEMICAL SAFETY

Helmut F. van Emden and David B. Peakall
Chapman & Hall, London, 1996, £24.99

Published jointly with the UN Environment Programme (UNEP) and the International Centre of Insect Physiology and Ecology (ICIPE), this is the third book to use *Silent Spring* in the title and to reappraise Rachel Carson's seminal original - still in print after selling two million copies.

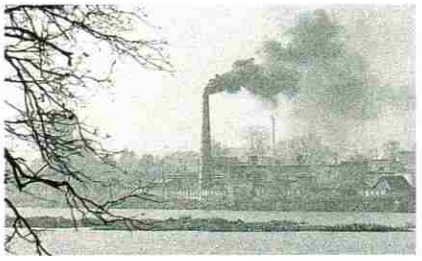
Though based on papers produced at a meeting in Kenya, the authors have produced a lively, readable text which stresses the importance of viewing the whole life-cycle of each chemical released into the environment and its interaction with other processes at various stages as it breaks down.

Films

SOVIET LEGACY

Toxic Pizza - Turn-around in Donetsk (1997) was commissioned to provide viewers in the Ukraine and other former Soviet Republics with a vision of a sustainable future.

In eastern Ukraine, the heavily industrialized Donbass region and the city of Donetsk constitute environmental disaster areas. The legacy of



TVE

the Soviet era is out-dated plants billowing out a cocktail of pollution that has undermined the health of people in the region. But with employment high and raging inflation, Donbass residents are opposed to closing down their old factories.

The message of the film is that an investment in cleaner technologies and know-how can bring economic and environmental benefits – but that investment will not be easy to come by. The first step is to convince local people that a wrecked environment is not always the inevitable price for industrial development.

CHERNOBYL REVISITED

A second film out of the Ukraine, returns to Chernobyl ten years after the world's worst nuclear accident.

For Chernobyl - Years and Destinies (1996), Ukrainian Director Georgy Shklyarevsky, revisits the region around the stricken power station and reveals that the devastating effects of the disaster are set to last well into the next century.

Three million people from 76 'dead' cities, villages and townships have been officially registered victims of Chernobyl. Subjected to a continuous flow of misinformation, many have become refugees; others – along with the 356,000 rescue workers – have developed debilitating, sometimes fatal, illnesses.

Meanwhile the power station itself continues to function, backed Shklyarevsky claims – by foreign aid. Together with the hundreds of humanitarian aid projects set up to help Chernobyl's victims, it consumes between five to eight per cent of the Ukraine's national budget.

Both the above programmes are part of TVE's *Moving Pictures 6* catalogue, which contains over 350 films covering the global spectrum of environment and development issues. The catalogue has just been launched on the World-Wide Web where you can browse through all the titles, view moving video clips, stills and information, and place orders. Find it at: http://www.oneworld.org/tve

Nick Rance

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VIDEOS IN DEMAND

The first four *People & the Planet* videos are in great demand. Copies have been ordered by more than 200 TV stations and non-government organizations in 50 countries.

All four 26-minute videos are available in English, French and Spanish versions from TVE at the address given above.

The four titles are **Investing in People** (showing the importance of community participation in successful environmental projects), **Victory for Women** (on the outcome of the Cairo Population Conference), **Learning for Life** (on the education of women and girls) and **Calling the Shots** (on how women are finding new ways of communicating).

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People & the Planet

Our next issue will report on sustainable tourism

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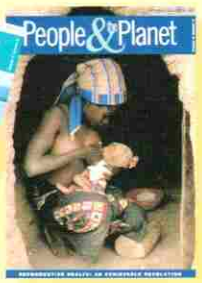
Volume 6 Number 2
Corals in crisis

Now is your chance to complete your collection of *People & the Planet*, at a **specially reduced price.** Receive the complete set of 21 issues at a specially reduced price of £31.50 in the UK (US$63 for overseas readers). Single issues £1.50 each in the UK (US$3 overseas), including postage.



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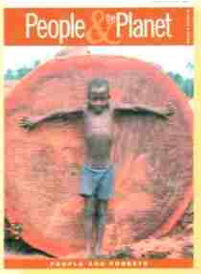

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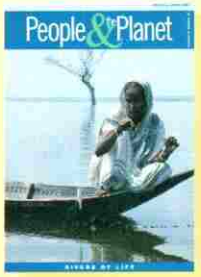

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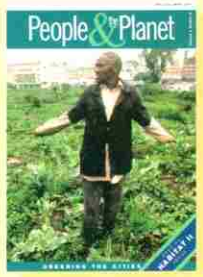

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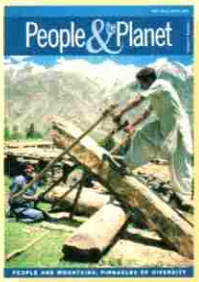

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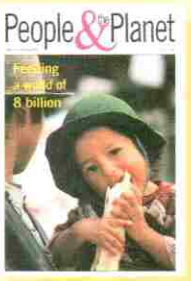

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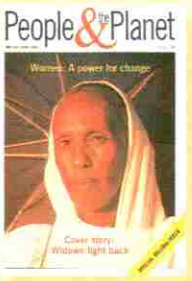
Feeding the world



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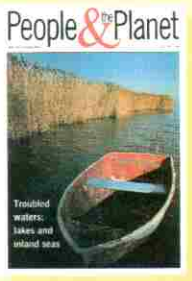

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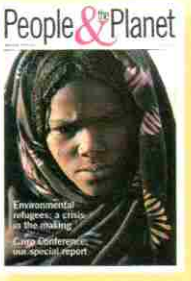

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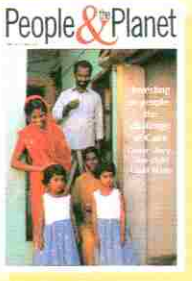

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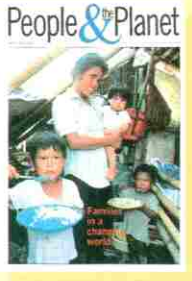

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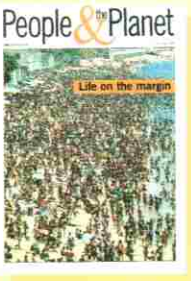

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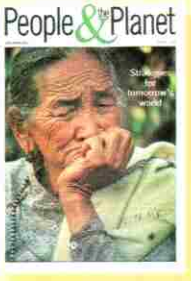

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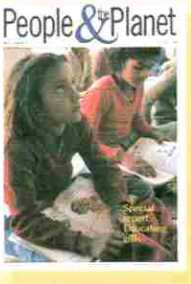

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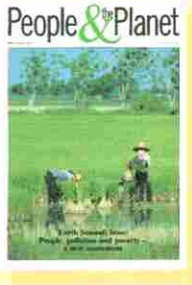

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